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Citation: Wittleder, S., Kappes, A., Krott, N. R., Jay, M. & Oettingen, G. (2019). Mental contrasting spurs energy by changing implicit evaluations of obstacles. *Motivation Science*, doi: 10.1037/mot0000140

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Mental Contrasting Spurs Energy by Changing Implicit Evaluations of Obstacles

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Abstract

Mentally contrasting a desired future with the obstacle of current reality produces expectancy-dependent changes in explicit evaluations of the obstacle of current reality. Past research has shown that these changes at least partly mediate the beneficial effects of mental contrasting on performance. We tested whether mental contrasting also leads to expectancy-dependent changes in *implicit* evaluations of the obstacle and whether those changes mediate mental contrasting effects on energization and performance. In three studies, participants named a desired future (improving interpersonal relationships, Study 1; excelling in a creativity test, Study 2; and improving one's eating habits, Study 3) and named an important obstacle standing in the way of attaining the desired future. They then engaged in either mental contrasting or control exercises. We assessed participants' implicit evaluations of their obstacles. Participants in the mental contrasting (vs. control) conditions implicitly evaluated their obstacles more negatively when they had high expectations of success (Studies 1, 2, and 3). Further, expectancy-dependent changes in implicit evaluations of obstacles (i.e., food temptations) mediated mental contrasting effects on energization, which, in turn, predicted commitment and performance (i.e., commitment to eat healthily and healthy eating over the course of two weeks, Study 3).

Keywords: implicit evaluations, expectations, mental contrasting, obstacles, self-regulation

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Imagine that you would like to improve your eating habits. Eating healthier, you fantasize, will lead you to be proud of yourself, to feel fitter and maybe even to be happier; you can see your new and improved self clearly in front of your mind's eye. But when the person at the cashier asks you to pay for the chocolate cake that you picked out for dessert, you awake from your daydream. A minute ago, the cake immediately appealed to you. But now, having seen the desired future of yourself eating healthier, has the cake changed its appeal. It may even arouse negative, rather than positive reactions, as it stands in the way of fulfilling your wish of eating healthier.

Turning fantasies about a desired future into reality can be challenging and energy draining. One effective strategy for overcoming the challenge and generating the energy is mental contrasting. When people mentally contrast a desired future (e.g., eating more healthily) with the obstacle of current reality (e.g., the chocolate cake), they will commit and strive for attaining their desired future (*Fantasy Realization Theory*, Oettingen, 1999, 2012, 2014). Mental contrasting energizes people to overcome the obstacle in order to attain their desired future (e.g., improving eating habits; Oettingen et al., 2009; Sevincer & Oettingen, 2015). But *how exactly* does mental contrasting mobilize the energy needed to overcome the obstacle and attain the desired future? We tested the idea that mental contrasting changes the immediate, affective reactions people have (implicit evaluations) towards their obstacle which, in turn, should mobilize the energy they need to surmount the obstacle and pursue their desired future. Hence, regarding the example in the beginning, we suggest that thinking about the chocolate cake as an obstacle standing in the way of a desired future might change the evaluation of the cake as

something negative, providing the energy to reject the cake on the way to fulfilling the wish of eating healthily.

Mental Contrasting

When people mentally contrast, they first identify and imagine a desired future (e.g., improving eating habits), and thereafter identify and imagine the main obstacle of the current reality standing in the way of attaining their desired future (e.g., the chocolate cake). If the obstacle of current reality is surmountable (expectations of attaining the desired future are high), people commit to and vigorously strive for their desired future. However, if the obstacle is insurmountable (expectations of attaining the desired future are low), people postpone or let go of attaining the desired future and possibly save energy and effort for more feasible endeavors (Oettingen, Pak, & Schnetter, 2001; review by Oettingen, 2012). The effects of mental contrasting on commitment and goal striving (goal pursuit) evidence across various life domains (academic, interpersonal, health; review by Oettingen, 2012) and across various indicators of goal pursuit such as cognitive (e.g., making plans), affective (e.g., feelings of anticipated disappointment in case of failure), motivational (e.g., feelings of determination), physiological (energization assessed by cardiovascular measures), and behavioral indicators (e.g., exertion of effort, quality of performance; review by Oettingen, 2012, 2014).

Energization is an important mechanism of mental contrasting effects on goal pursuit. Mental contrasting mobilizes people's energy when they have high expectations of attaining the desired future but lowers people's levels of energy when they have low expectations of attaining the desired future, so that they can invest their energy in other, more promising endeavors. Those expectancy-dependent changes in energization, measured both physiologically (i.e., systolic blood pressure, Oettingen et al., 2009; Study 1) and by self-report (Oettingen et al., 2009; Study

2), in turn, mediate mental contrasting effects on effort and performance toward the desired future.

Aside from mental contrasting, people frequently engage in other forms of thinking about a desired future (Sevincer & Oettingen, 2013). People may, for instance, elaborate on the current reality *before* the desired future (i.e., reverse contrasting). This type of thought does not set the future as a reference point for the reality and fails to induce the perception of the reality as an obstacle standing in the way of attaining the desired future (Kappes, A., Wendt, Reinelt, & Oettingen, 2013). Expectations of success are thus not taken into consideration and cannot guide energization and commitment to the desired future (Oettingen, 2012, Oettingen et al. 2001). Reverse contrasting as a self-regulatory strategy thereby suggests that both, content (future, obstacle) and order (first future, then obstacle) are important for translating.

One potential explanation is that content and order of future thought are both important to change the perception of reality in line with expectations of success. In particular one might need to first elaborate the desired future to understand that the reality is an obstacle that stands in the way of attaining the desired future (Kappes, A. et al., 2013). Indeed, when expectations of attaining the desired future are high, mental contrasting strengthens the meaning of current reality as an obstacle whereas when expectations of attaining the desired future are low, it weakens the meaning of reality as an obstacle (Kappes, A. et al., 2013). In the present research, we extend these findings but examining whether mental contrasting also changes people's *implicit evaluation* of their reality so that it is now evaluated as a negative obstacle. This implicit evaluation, in turn, should help people mobilize the energy needed to overcome their obstacle and to attain their desired future.

Self-Regulation by Mental Contrasting

Within the larger literature on self-regulation, some research has focused on self-control as a means to engage in behavior that offers greater long-term benefits by dismissing alternatives (e.g., temptations) that stand in conflict with successful goal realization (Gollwitzer & Moskowitz, 1996; Loewenstein, 1996; Metcalfe & Mischel, 1999). For example, Fishbach, Friedman, and Kruglanski (2003) propose that self-regulation is guided by self-control, that is, a functional mechanism of *temptation-goal activation*. Specifically, they state that for people who are committed to a higher-order goal, this higher-order goal is automatically activated whenever people are presented with an alternative (e.g., a temptation), thereby shielding goal pursuit. The temptation-goal activation account differs from mental contrasting in that it focuses on *existing* goal commitments. In contrast, mental contrasting research focuses on the *creation* of strong goal commitments. Specifically, it is a conscious self-regulation strategy that creates strong goal commitments and goal striving via implicit processes, but only when expectations of success are high.

Another line of research focuses on the devaluation of temptations (e.g., unhealthy snacks) as a means of resisting them to shield goal pursuit (e.g., weight loss) in the face of dilemmas (*counteractive self-control theory*; Myrseth, Fishbach, & Trope, 2009; Trope & Fishbach, 2000). At first sight, this account seems similar to mental contrasting changing people's evaluations of the obstacle that stands in the way of attaining a desired future. However, whereas counteractive self-control theory describes strategies that people use when they are already committed to a goal (e.g., weight loss) and encounter temptations (e.g., unhealthy snacks), mental contrasting leads people to evaluate the obstacle of reality more negatively only when they have high expectations of success, thereby forming strong goal commitments.

Finally, *construal level theory* (Trope & Liberman, 2010) states that an abstract (higher level construal) mental representation of a goal, compared to a more concrete (lower level construal) mental representation, helps people to exert self-control in the face of temptations (Fujita, Trope, Liberman, & Levin-Sagi, 2006). Similar to research showing that forming cool and abstract representations of temptations might bolster successful goal pursuit by undermining the influence of these temptations on behavior (Metcalf & Mischel, 1999; Mischel & Ayduk, 2004; Mischel, Shoda, & Rodriguez, 1989), a study by Fujita and Han (2009) showed that participants with a high-level (vs. low level) construal of their goal to eat healthily were better able to resist the temptation of eating a sweet, and choosing an apple instead. Mental contrasting differs from construal level theory in that mental contrasting does not focus on the abstraction of the mental representations of a desired future or the obstacle. Instead, mentally contrasting the desired future with the reality makes people realize that the reality is an obstacle standing in the way of attaining the desired future when they have high expectations of success. The desired future may thereby pertain to a long-term event (i.e., high-level construal), or to a closer, short-term event (i.e., low-level construal).

Mental Contrasting and Implicit Evaluations of the Obstacle

Previous studies have investigated implicit evaluations in the context of self-regulation (Balcetis & Dunning, 2006; Ferguson & Bargh, 2004; Ferguson, Hassin, & Bargh, 2008; Ferguson & Wojnowicz, 2011; Ferguson & Zayas, 2009; see also Bargh, 2007). Implicit evaluations are instantaneous, unintentional, and effortless evaluations of objects as positive or negative (e.g., Chaiken & Stangor, 1987; Fazio, 1986; McGuire, 1985; Spielman, Pratto, & Bargh, 1988). They are automatically activated upon encountering a physical object or a non-physical object such as a mental idea (Fazio, 1995, 2007). Implicit evaluations are among the

implicit processes that are unintentional or automatic and that lie outside of people's conscious awareness (Bargh, 1994; Bargh, Chaiken, Gendler, & Pratto, 1992; Bargh, Chaiken, Raymond, & Hymes, 1996; Fazio, Sanbonmatsu, Powell, & Kardes, 1986). They rely on the assumption that mental associations exist between various concepts, such as, for example, target concepts and positive or negative valence, which lie outside of people's conscious awareness and therefore cannot be assessed with self-report measures (Bargh, 1994; Fazio, 1986; Nosek, Hawkins, & Frazier, 2011). As an example, stimuli relevant to the self may automatically activate the self-concept (Straumann & Higgins, 1987). Similarly, stimuli relevant to the self may automatically activate concepts of positive valence (De Houwer, 2003). Implicit processes are characterized by the following four features: First, they lack *awareness*, that is, people are unaware of the origins, meaning, and occurrence of the mental processes. Second, they lack *intention*, that is, a person may not be consciously involved in the initiation of the mental process. Third, they are *efficient*, that is, implicit mental processes do not require many mental resources. Fourth, they lack *controllability*, that is, a person may not be able to stop or alter the mental process (Bargh, 1994). In order to measure those implicit processes, research typically uses analyses of reaction times or error rates. Responses given on such implicit measures are assumed to directly reflect people's implicit processing of stimuli because these measures reduce the opportunity to engage in effortful processing (Olson & Fazio, 2002).

For example, during affective priming, participants categorize target words as quickly as possible as positive or negative. Those target words are preceded by a prime word that can be presented subliminally (i.e., below the threshold of conscious awareness) or supraliminally (i.e., above the threshold of conscious awareness). If a participant is faster in categorizing a target word as positive (vs. negative) when it is preceded by the prime word, this infers a stronger

mental association between the prime word and positive (vs. negative) valence. Thus, it infers a relatively positive implicit evaluation of the prime word. In sum, during implicit measurements, the implicit evaluation of primes words (such as obstacles of reality) can be assessed by observing the difference between participants' reaction times in categorizing positive vs. negative target words after the (subliminal or also supraliminal) presentation of their idiosyncratic obstacles.

Research on implicit evaluations in the context of goal pursuit shows that people attend to and evaluate objects relevant to current goal pursuit with greater urgency (Bruner, 1957; Dijksterhuis & Aarts, 2003). Those goal-dependent changes in implicit evaluations, in turn, result in approach behavior and goal pursuit (Ferguson, 2007; Greenwald & Banaji, 1995; Roediger, 1990). Active goal pursuit is associated with positive implicit evaluations of goal-related objects, such as means and activities (e.g., Dijksterhuis & Aarts, 2003; Custers & Aarts, 2005, 2007; Ferguson, 2007; Ferguson, 2008; Ferguson & Bargh, 2004), and a negative explicit and implicit evaluation of temptations (Fishbach, Zhang, & Trope, 2010; Myrseth et al., 2009). For example, people with an active academic goal and high expectations of success (i.e., for attaining a high GPA) displayed a more negative implicit evaluation toward objects that impeded attainment of their goal (e.g., TV) compared to participants without an active academic goal and with low expectations of success (Ferguson, 2007; Ferguson et al., 2008). Similarly, successful self-regulation, facilitated by higher-level construals in one domain (i.e., relationships) was associated with more negative implicit evaluations of temptations in another domain (i.e., dieting; Fujita & Han, 2009).

Building on the finding that active goal pursuit is associated with negative implicit evaluations of temptations (Ferguson, 2007; Fujita & Han, 2009), and considering that mental

contrasting activates goal pursuit and changes the *explicit evaluation* of reality as a negative obstacle standing in the way of attaining the desired future (Kappes, A. et al., 2013, Study 1), we ask whether mental contrasting effects on energization and performance can be explained by changes in *implicit evaluations* of the obstacle of current reality. Explicit and implicit evaluations are distinct but related constructs, indicated by the findings that these measures are not always (strongly) correlated. Correlations between implicit and explicit attitude measures vary widely from weakly to strongly positive (Nosek, 2005, 2007).

Investigating implicit evaluations is important, first, to support previous findings on mental contrasting effects on explicit evaluations of obstacles and to argue that these effects were not simply due to social desirability or experimenter demand. Explicit evaluations can be easily manipulated because people may simply edit their answers to be in line with perceived norms, leading to statements that do not reflect actual behavioral tendencies (e.g., Crowne & Marlowe, 1960; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio, Jackson, Dunton, & Williams, 1995). Second, investigating implicit evaluations is important to further demonstrate that mental contrasting affects goal-pursuit by nonconscious processes. In contrast to explicit evaluations, implicit evaluations can predict behavior that runs off outside of people's awareness, is spontaneous, or unintended (Asendorpf, Banse, & Mücke, 2002; Dovidio et al., 1997; Perugini, 2005). They also predict behavior that is difficult to control (e.g., Friese, Hofmann, & Wänke, 2008). If mental contrasting achieves its effects by changing implicit evaluations, this means that after people engage in mental contrasting, they can change their behavior without being aware of it and pursue their goals without investing much mental effort. Thus, newly formed implicit evaluations may help to override existing automatic responses, such as strong impulses and bad habits (see also the *horserace model*; Gollwitzer, 2014). In sum, changes in

implicit evaluation should enable people to successfully pursue their goals even when top down-control is depleted, or under conditions of low cognitive resources.

We propose that mental contrasting changes people's implicit evaluations of their obstacle of reality based on expectations of success. That is, mental contrasting should establish a unique type of implicit evaluation of the obstacle of reality. This evaluation should depend on expectations of success as it signals whether the obstacle of reality can be overcome on the way to attaining the desired future. In turn, for mental contrasting, changes in the implicit evaluation of the obstacle of reality should predict energization to overcome this obstacle. In contrast, the implicit evaluation of the obstacle of reality in the control conditions (e.g., reverse contrasting) should neither be in line with expectations of success, nor signal whether the impediment of the desired future can be overcome or not. In turn, for control conditions, implicit evaluations of the obstacle of reality should not be in line with expectations of success, should not predict energization, and should thus not be relevant for subsequent performance.

The Present Research

In three studies, we examined whether the use of mental contrasting changes implicit evaluations of obstacles of reality (Studies 1 & 2) and whether those changes in implicit evaluations predict subsequent changes in feelings of energization and performance (Study 3). We tested our hypotheses regarding wishes related to three major life domains: interpersonal relationships (Study 1), creativity (Study 2), and healthy eating (Study 3). As dependent variables, we assessed participants' implicit evaluations of their obstacles of reality. Because there currently exists no gold standard for the assessment of implicit evaluations (Gawronski & De Houwer, 2014) and we wanted to demonstrate robustness of our findings, we used different measures. Criteria for choosing our measures were (1) their validity as demonstrated in studies

similar to ours and (2) their suitability to assess implicit evaluations of a single target concept. The second point was especially relevant since in our research, we aimed to assess participants' implicit evaluations of one single target concept: their idiosyncratic obstacle of reality.

One common measure of implicit evaluations is the affective priming task which has been used to measure evaluations with prime presentations both above and below the threshold of conscious awareness (i.e., unmasked supraliminal presentation and masked subliminal presentation, respectively; Fazio et al., 1986). The use of an unmasked affective priming task or other common measures of implicit affect, such as the Affect Misattribution Procedure (AMP), have been criticized for their vulnerability to conscious intentions. Specifically, participants may base their responses on intentional evaluations, which may undermine the implicit nature of the task (Bar-Anan & Nosek, 2012). However, other research has demonstrated equivalent validity of unmasked and masked primes in the measurement of implicit evaluations (e.g., Bodner & Masson, 2001, 2003). Further, subliminal and supraliminal goal priming have been found not to differ in their effects on physiology (e.g., pupil dilation) and behavior (e.g., force exertion; Takarada & Nozaki, 2018).

To conceptually replicate our results by using different measures of implicit evaluations, we chose to employ a masked affective priming task in Study 1, and an unmasked affective priming task in Study 3 (see also Bargh et al., 1992; Bargh et al., 1996; Fazio et al., 1995; Fazio et al., 1986; Klauer, Eder, Greenwald, & Abrams, 2007; Klauer & Musch, 2003). Further, because in Study 3 we aimed to investigate the relation between implicit evaluations and actual behavior, we based our measures on previous research that similarly assessed this relation by using an unmasked version of the affective priming task (e.g., Ferguson, 2007; Ferguson &

Bargh, 2004). To establish comparability between Study 3 and Study 1 we also used the same task procedure as in Study 1, however, we presented unmasked instead of masked primes.

In Study 2, we chose an extrinsic affective Simon task (EAST; De Houwer, 2003) as a variant of the widely used Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). Whereas the IAT has been criticized regarding its suitability to assess implicit evaluations of a single target concept (Wittenbrink, 2007; Teige-Mocigemba, Klauer, & Sherman, 2010), the EAST is suitable to assess implicit evaluations of a single target concept (De Houwer, 2003). Specifically, the EAST has been successfully used to assess implicit evaluations of target stimuli from different areas, such as stimuli related to self-esteem (e.g., the first name; De Houwer, 2003), food (Roefs, Herman, MacLeod, Smulders, & Jansen, 2005), alcohol (De Houwer, Crombez, Koster, & De Beul, 2004), and stimuli related to anxiety (e.g., spiders; Ellwart, Becker, & Rinck, 2005; Huijding & de Jong, 2005).

Study 1: Interpersonal Relationships

In Study 1, we first asked participants to name an idiosyncratic wish regarding an important interpersonal relationship. To manipulate high versus low expectations of success, participants were assigned to a high vs. low expectations condition: Half of the participants named a relationship wish that they were very likely to fulfil, the other half named one that they were very unlikely to fulfil. Participants were then assigned to either a mental contrasting condition, a reverse contrasting condition, or a valence control condition. As dependent variable, we assessed participants' implicit evaluations of their idiosyncratic obstacle, using a masked affective priming task (Fazio et al., 1986).

During this task, we infer the evaluation of a mental construct (i.e., the obstacle) by the extent to which it affects response times to positive or negative concepts in a sequential priming

procedure. Participants are first presented with a masked or unmasked prime. Directly after this, a target appears that participants categorize as either positive or negative. Less time is needed to categorize a target stimulus as positive or negative when a concept with the same valence precedes the stimulus (Fazio et al., 1995). The implicit evaluation of a concept (such as an obstacle) can be assessed by presenting it as a prime preceding both positive and negative target words and then observing the difference between reaction times of individuals in categorizing those positive and negative target words. The affective priming paradigm has been studied intensively and provides a valid means of obtaining an indirect estimate of a positive or negative implicit evaluation (Klauer & Musch, 2003).

We hypothesized that only participants in the mental contrasting condition (versus control conditions) would change their implicit evaluation of the idiosyncratic obstacle of reality, and that the direction of the change depended on their expectations of success. We expected that only participants in the mental contrasting condition would subsequently show a more negative implicit evaluation of their idiosyncratic obstacle of reality if they were in the high (versus low) expectations of success condition.

Method

Participants

One hundred forty participants (92 women, $M_{\text{age}} = 25.5$ years, $SD_{\text{age}} = 6.9$ years, age range: 18–62 years) from a large German University took part in the study, after we had excluded 25 participants who did not identify their first language as German. The study duration was approximately 20 minutes and participants received 5 Euro as compensation. The study consisted of a 2 (expectations of success: high vs. low) x 3 (self-regulation strategies: mental contrasting vs. reverse contrasting vs. valence control) between-subjects design. We randomly

assigned participants to one of six conditions: mental contrasting and high expectations of success ($n = 17$), mental contrasting and low expectations of success ($n = 22$), reverse contrasting and high expectations of success ($n = 22$), reverse contrasting and low expectations of success ($n = 28$), valence control and high expectations of success ($n = 22$), and valence control and low expectations success ($n = 29$).

We conducted a sensitivity power analysis in order to determine the minimal detectable effect that could be obtained within our study design for three groups. We recruited 140 participants. The sensitivity power analysis indicated that, given 80% power ($1 - \beta$) at a .05 alpha level ($\alpha = .05$), the minimal detectable effect size for our experimental manipulation would be $d = 0.53$.

Procedure and Measures

We informed participants that the study was designed to determine how people think about and deal with their desired futures, as well as how their thoughts relates to their verbal skills. We asked all participants to name a desired future that was important to them and that pertained to their interpersonal relationships. Subsequently, they answered questions about their wish and performed an affective priming task. At the end of the study, participants indicated their gender, age, and first language. Participants were then thanked for their participation and debriefed.

Manipulation of expectations of success. All participants were first asked to name a desired future that pertained to their interpersonal relationships. To manipulate *high* expectations of success, one group of participants was asked to name a desired future near and dear to their hearts that was *likely* to be achieved. Participants named desired futures such as “to find a best friend”. In contrast, to manipulate *low* expectations of success, the other group of participants

was asked to name a desired future near and dear to their hearts that was *unlikely* to be achieved. Participants named desired futures such as “improving my relationship with my brother”.

Obtaining words for the masked affective priming task. To obtain words for use in the masked affective priming task, all participants named their most important and critical inner obstacle that could prevent that they attained the desired future they had named before. Thereafter, participants specified one word to summarize their personal obstacle of reality, such as “shy” or “egoistic”.

Manipulation of self-regulation strategy. In order to manipulate participants’ self-regulation strategy, they received varying instructions to spur different mental elaborations, depending on the condition. Therefore, participants were randomly assigned to either the mental contrasting condition, the reverse contrasting condition, or the valence control condition. Participants in the mental contrasting condition mentally elaborated and wrote about the most wonderful outcome they associated with realizing their desired future. We then presented them again with the most critical personal obstacle of reality that they had named before and asked them to mentally elaborate on this obstacle. Participants in the reverse contrasting condition mentally elaborated and wrote about the same aspects as mental contrasting participants but in reverse order. Thus, they started with mentally elaborating and writing about their most critical personal obstacle of reality, before mentally elaborating and writing about the most wonderful outcome they associated with realizing their desired future. Participants in the valence control condition mentally elaborated and wrote about a positive and a negative experience with a professor, beginning with the positive experience.

Dependent variable: Implicit evaluation of the obstacle. To assess participants’ implicit evaluation of their personal obstacle, they completed a masked affective priming task

(see Olson & Fazio, 2002). Each trial consisted of a mask (e.g., ASPOIJFDSAEQWRJFADSW) for 300 milliseconds, a prime word for 43 milliseconds, another mask for 14 milliseconds, and a target word. The target word remained on the screen until participants indicated whether each target word was positive or negative. Participants pressed the right key (i.e., '/'-key) for negative and the left key (i.e., 'z'-key) for positive target words. For the depiction of an exemplary trial for the masked affective priming task see supplemental materials. Primes were words that were either positive (i.e., birthday), negative (i.e., crime), or neutral (e.g., table). Along these prime words, we used the one word which participants had generated in the beginning of the study to summarize their personal obstacle of reality (i.e., reality prime). The target words included twelve strongly positively valenced words (e.g., friend) and twelve strongly negatively valenced words (e.g., trash). In a previous study, these prime and target words had been found to carry a strong positive or negative valence, respectively (Klauer & Musch, 1999). For a complete list of prime words, target words, and masks, see supplemental materials. Participants completed a total of two blocks, with four practice trials and 48 main trials each. Within one block, each prime appeared three times with a positive target and three times with a negative target. Sampling with replacement was used to select the masks. The experiment was run on a standard PC using MediaLab and DirectRT software. Stimuli were presented on a 19-inch CRT monitor, viewed at a distance of 50 cm. Prime words, target words and masks were displayed in white color (#FFFFFF) in the center of the screen. The font was Arial, bold, 24 pt. The rest of the screen showed a black background (#000000). The inter-trial interval was 100 milliseconds.

Reality evaluation index (REI). We infer the evaluation of a prime word by the extent to which its presentation affects response times to positive or negative target words. Participants are first presented with a masked prime word. Directly after this, a target word appears that

participants categorize as either positive or negative. If less time is needed to categorize a negative target word compared to a positive target word, we infer a comparatively negative implicit evaluation of the preceding prime word (Fazio et al., 1995).

We computed a score to reflect participants' implicit evaluation of the reality primes, as well as of the neutral primes (Ferguson, 2008). We subtracted the median reaction times in trials using reality primes and positive targets from the median reaction times in trials using reality primes and negative targets (i.e., [reality prime & negative target] - [reality prime & positive target]). The same computation was done for respective trials with neutral primes (i.e., [neutral prime & negative target] - [neutral prime & positive target]). We received a reality evaluation score and a neutral evaluation score, with lower scores indicating faster reaction times towards negative (vs. positive targets) preceded by the respective primes. Thus, lower scores indicate a more negative implicit evaluation of the respective primes. In order to create an index that reflected relative implicit evaluations of the reality prime while adjusting for potential baseline evaluations of the neutral primes, we subtracted the neutral evaluation scores from the reality evaluation scores (i.e., [reality evaluation score] - [neutral evaluation score]). This final reality evaluation index (REI) indicated the implicit evaluation of reality primes above and beyond any baseline implicit evaluation of neutral primes. Therefore, lower scores indicate a more negative implicit evaluation of participants' personal obstacle.

Results

Data Preparation

Reaction times were non-normally distributed, with skewness of 10.49 ($SE = 0.01$) and kurtosis of 105.86 ($SE = 0.02$). A Kolmogorov-Smirnov test indicates that the reaction times do not follow a normal distribution, $D(17769) = .23, p < .001$. In all three studies, we used medians

as a more robust central tendency parameter (Ratcliff, 1993; Whelan, 2008) and we did not use cutoffs as they can introduce asymmetric biases into statistics such as the median (Ulrich & Miller, 1994). To lessen the influence of outliers, we excluded five participants (3.50 %) with extreme error rates (i.e., $\geq 20\%$; Wentura & Degner, 2010). Thus, we analyzed the data of 138 out of 143 (96.5 %) participants. The frequency of exclusion did not differ by manipulation of expectations of success, $\chi^2(1, N = 143) = .04, p = .85$, or strategy, $\chi^2(2, N = 143) = 3.49, p = .17$. For reaction time analyses, we only used correct responses on the masked affective priming task. The error rate was 6.51 %.

Randomization

Indicating that randomization was successful and there were no baseline differences in relevant baseline measures between conditions, an ANOVA with expectations of success (high, low) and strategy (mental contrasting condition, reverse contrasting control condition, valence control condition) as between-subject factors, and age as dependent variable, showed no main effect of manipulation of expectations of success, $F(1,132) = .43, p = .52$, no main effect of strategy, $F(2,132) = .53, p = .59$, and no interaction effect between expectations of success and strategy, $F(2,132) = 1.36, p = .26$. Furthermore, there was no difference in gender (female, male) for manipulation of expectations of success (high, low), $\chi^2(1, N = 138) = 1.87, p = .17$, or for manipulation of strategy (mental contrasting condition, reverse contrasting control condition, valence control condition), $\chi^2(2, N = 138) = .26, p = .88$.

Effects of Gender and Age

Gender did not have a significant effect on the reality evaluation index, $F(1,133) = .58, p = .45, \eta_p^2 = .004$. Age was not correlated with the reality evaluation index, $r = .06, p = .51$.

Manipulation Check: Masked Affective Priming Task

To demonstrate that the masked affective priming task was able to measure implicit evaluation of prime words, we computed evaluation indexes for those trials with a negative prime (i.e., crime) and for those with a positive prime (i.e., birthday) in the same way as for the REI. Larger scores indicate greater implicit positivity for positive primes compared with control primes. A one-way repeated measures ANOVA confirmed that the negative evaluation index was lower ($M = -7.30$ ms, $SD = 73.31$ ms), indicating greater negativity, than the positive evaluation index ($M = -2.03$ ms, $SD = 71.77$ ms), $F(1,136) = 6.95$, $p = .009$, $\eta_p^2 = .05$. Age was added as a covariate because it correlated with the positive evaluation index, $r = .21$, $p < .05$.

Dependent Variable: Implicit Evaluation of the Obstacle

We predicted that mental contrasting (versus control conditions) should change participants' implicit evaluation of their personal obstacle depending on expectations of success. Only participants in the mental contrasting condition (vs. control conditions) should show more negative implicit evaluations of their idiosyncratic obstacle of reality (i.e., lower REI) in the high than in low-expectancy condition.

To test our prediction, we specified an ANOVA with expectations of success (high vs. low) and strategy (mental contrasting condition vs. reverse contrasting condition vs. valence control condition) as between subject factors and REI as a dependent variable. There was no significant main effect of expectations of success, $F(1,132) = 3.90$, $p = .05$, and no significant main effect of self-regulation strategy, $F(2,132) = 1.18$, $p = .31$. However, the predicted interaction effect between expectations of success and self-regulation strategy was significant, $F(2,132) = 4.14$, $p = .02$, $\eta_p^2 = .06$. A planned contrast (high expectations of success = -1; low expectations of success = 1) revealed that using mental contrasting with high expectations of success resulted in a lower (indicating more negative) REI ($M = -57.53$ ms, $SD = 117.13$ ms)

than using mental contrasting with low expectations of success ($M = 26.09$ ms, $SD = 61.69$ ms), $t(1, 37) = 2.88, p = .007$. In contrast, there was no significant difference between high expectations of success ($M = 19.82$ ms, $SD = 75.83$ ms) and low expectations of success ($M = 1.80$ ms, $SD = 79.75$ ms) in the reverse contrasting control condition, $t(1, 47) = .80, p = .43$, or between high expectations of success ($M = -15.48$ ms, $SD = 60.70$ ms) and low expectations of success ($M = 2.89$ ms, $SD = 92.03$ ms) in the valence control condition, $t(1, 48) = .81, p = .42$ (Figure 1).

Planned contrasts (mental contrasting condition = 1; reverse contrasting control condition = -.5; valence control condition = -.5) revealed that participants in the mental contrasting condition with high expectations of success showed a lower REI than participants in the control conditions with high expectations of success, $t(1, 58) = 2.46, p = .02$. Participants in the mental contrasting condition with low expectations of success did not differ significantly from participants in the control conditions with low expectations of success, $t(1, 74) = 1.18, p = .24$.¹

Discussion

In line with our predictions, mental contrasting (versus control conditions) modulated the implicit evaluations of participants' obstacle of reality, depending on their expectations of success. After mental contrasting, participants with high expectations of success displayed a more negative implicit evaluation of their obstacle than those with low expectations. In contrast, there was no significant difference in such implicit evaluations in the two control conditions.

¹ We also computed REIs by using means and the usual cutoff of 3 standard deviations from the mean. Also here, we found that the predicted interaction effect between expectations of success and self-regulation strategy was significant, $F(2, 132) = 4.05, p = .02, \eta^2 = .06$. A planned contrast (high expectations of success = -1; low expectations of success = 1) revealed that using mental contrasting with high expectations of success resulted in a lower (indicating more negative) REI ($M = -45.23$ ms, $SD = 103.58$ ms) than using mental contrasting with low expectations of success ($M = 22.91$ ms, $SD = 60.88$ ms), $t(1, 37) = 6.60, p = .01$. In contrast, there was no significant difference between high expectations of success ($M = 22.12$ ms, $SD = 68.58$ ms) and low expectations of success ($M = 1.68$ ms, $SD = 58.57$ ms) in the reverse contrasting control condition, $t(1, 47) = 1.27, p = .27$, or between high expectations of success ($M = -21.75$ ms, $SD = 49.03$ ms) and low expectations of success ($M = -7.02$ ms, $SD = 85.82$ ms) in the valence control condition, $t(1, 48) = .51, p = .48$.

Thus, mental contrasting paired with high expectations depicted the reality as a negatively evaluated obstacle that needs to be overcome in order to fulfill their interpersonal wish. As an example, a student who had the high-expectancy wish of improving her relationship with her roommate would, after mentally contrasting this wish with her obstacle (e.g., her messiness), show a negative implicit evaluation of this obstacle.

Participants in the reverse contrasting control condition received identical instructions as in the mental contrasting condition, but in reversed order. Hence, participants in the reverse contrasting control condition were instructed to generate the same content as participants in the mental contrasting condition. However, they started with the elaboration of their obstacle of reality. As elaborating the reality first and then the future did not change the implicit evaluation of the obstacle, we can dismiss the alternative explanation that the mere elaboration of both the future and the obstacle of reality would elicit a change in implicit obstacle evaluation.

In the valence control condition participants elaborated a positive, then a negative experience with a professor, but no relevant content. As the valence control condition also did not change the implicit evaluation of the obstacle of reality, we may reject the alternative explanation that the change in implicit evaluation may have been due to the mere elaboration of a positive aspect followed by a negative aspect.

A limitation of Study 1 was that our manipulation of expectations of success potentially influenced the type of desired futures participants named. Hence, in Study 2, all participants elaborated the same desired future (i.e., being successful in a creativity test) and expectations of success were measured instead of manipulated. Another potential drawback of Study 1 concerns the valence control condition. The elaboration of a positive and a negative experience with a professor may have been too unrelated to the topic of study. Hence, this cover story may have

prompted participants to (rightly) assume that they were in the control condition. Therefore, in Study 2, the valence control condition was replaced by a distraction control condition. Finally, to replicate our findings with a different implicit paradigm, we employed an extrinsic affective Simon task (De Houwer, 2003) to measure implicit evaluations.

Study 2: Creativity

In Study 2, we invited students to participate in a study about creativity. First, all participants identified the wish of being successful in an upcoming creativity test. Thereafter, participants were randomly assigned to either a mental contrasting condition, a reverse contrasting condition, or a distraction control condition. The mental contrasting condition and the reverse contrasting condition were identical to Study 1. Participants in the distraction control condition solved arithmetic problems. We chose this active control group rather than a passive no-treatment control condition because we reasoned that solving arithmetic problems requires intensive concentration and would prevent participants from thinking or imagining their creativity wish or from spontaneously engaging in mental contrasting. In fact, research has shown that 9-30% of people may spontaneously use mental contrasting (Sevincer & Oettingen, 2013).

As a dependent variable, we again assessed participants' implicit evaluations of their idiosyncratic obstacle of reality. Here, we employed an extrinsic affective Simon task (EAST; De Houwer, 2003). The EAST, a modified version of the Implicit Association Test (IAT; Greenwald et al., 1998), infers the evaluation of a mental construct by comparing responses to trials within a single task. Participants classify white words on the basis of stimulus valence and colored words on the basis of color. For colored words with a positive valence (e.g., flowers), responses are faster when the correct response is matched to the response that is also assigned to

positive white words. The reverse pattern is true for colored words carrying a negative valence (e.g., insect). Here, responses are faster when the correct response matches the response assigned to negative white words.

In Study 2, we hypothesized that only participants in the mental contrasting condition (as opposed to control conditions) would show a change in implicit evaluations of the idiosyncratic obstacle, depending on their expectations of success. Only for participants in the mental contrasting condition (as opposed to control conditions), the higher their expectations of success were, the more negative should be their implicit evaluations of their idiosyncratic obstacle.

Method

Participants

The participants were 146 students (110 women, $M_{\text{age}} = 20.2$ years, $SD_{\text{age}} = 1.2$ years, age range: 19–25 years) after we had excluded 51 participants who did not identify English as their first language. The study took place at a large university in the United States of America. Participants were randomly assigned to either a mental contrasting condition ($n = 50$), a reverse contrasting condition ($n = 57$), or a distraction control condition ($n = 39$). The study duration was approximately 30 minutes. As compensation, participants received partial course credit.

We conducted a sensitivity power analysis in order to determine the minimal detectable effect that could be obtained within our study design for three groups. We recruited 146 participants. The sensitivity power analysis indicated that, given 80% power ($1 - \beta$) at a .05 alpha level ($\alpha = .05$), the minimal detectable effect size for our experimental manipulation would be $d = 0.52$.

Procedure and Measures

Participants learned that the study was designed to better understand how people think about creativity and how this relates to creative abilities. To establish the desired future of being successful in the upcoming creativity test, participants read a short paragraph about creativity and about how being more creative than average leads to success in various areas of life. Subsequently, participants were asked about their expectations of being successful in the upcoming creativity test and were then assigned to the experimental conditions. Finally, all participants performed the EAST. At the end of the study, participants indicated their gender, age, year in school, and first language. Participants were thanked for their participation and debriefed about the purpose of the study.

Expectations of success and baseline measures. To measure expectations of success, we asked participants how likely they thought it would be for them to be successful in the upcoming creativity test. To see if being successful in the creativity test was in fact a desired future for participants, we asked them how important it was to them that they would be successful in the upcoming creativity test. Participants answered both questions on Likert scales ranging from 1 (*not at all*) to 7 (*very*).

To ensure that participants in the different experimental groups did not differ in creative potential, they completed the Creative Personality Scale (CPS; Gough, 1979). The CPS is considered a reliable and valid measure of creative potential (Domino, 1994). The scale consists of 18 adjectives that reflect higher creativity (e.g., insightful) and 12 adjectives that reflect lower creativity (e.g., conventional). Participants rated how well various adjectives described them. Participants received 1 point if they indicated that a high creativity adjective described them very well, and they received -1 point if they indicated that a low creativity adjective described them

very well. Therefore, the total sum score ranged from -12 to 18, with higher scores indicating higher creative potential.

Obtaining words for the EAST. To obtain words for use in the EAST, participants named their most important and critical personal obstacle of reality that could prevent them from being successful in the upcoming creativity test. They specified one word to summarize their idiosyncratic obstacle of reality. Examples included “close-mindedness” and “laziness”.

Manipulation of self-regulation strategy. Participants first read a short introduction, informing them that we wanted to learn more about their thoughts about being creative to gain a better understanding of creativity. We told them to take their time and feel free to express every thought that came to mind. Then, participants were randomly assigned to either the mental contrasting condition, the reverse contrasting condition, or a distraction control condition. Participants in the mental contrasting condition mentally elaborated and wrote about the most wonderful outcome they associated with being successful in the upcoming creativity test, followed by mentally elaborating and writing about their most critical personal obstacle of reality that could prevent them from being successful in the creativity test. In the reverse contrasting condition, participants had to mentally elaborate and write about the same aspects, but in reverse order. In the distraction control condition, they worked on arithmetic problems modified from Düker’s (1949) “Concentration Achievement Test” (*Konzentrations-Leistungs-Test, KLT*; Düker & Lienert, 1965). In total, they completed nine arithmetic problems. Each of these consisted of two mathematical operations that could either be an addition or a subtraction of two single digit numbers (i.e., less than 10). Participants had to solve the two operations, remember the result, and then subtract the smaller number from the larger number and fill in the final result in a box. This process, although simple, is very tedious and requires intensive concentration.

Dependent variable: Implicit evaluation of the obstacle. To assess participants' implicit evaluations of their personal obstacle, participants completed the EAST (De Houwer, 2003). The EAST consists of two tasks that alternated randomly from trial to trial. Participants classified words based on their valence (i.e., valence task) or on their color (i.e., color task). Participants classified white words on the basis of their valence (i.e., positive or negative) and colored words on the basis of their color (i.e., blue or yellow). When the presented word was white, participants pressed a left key (i.e., 'z'-key) for positive words and a right key (i.e., '/'-key) for negative words. When the presented word was in color, participants pressed the left key (i.e., 'z'-key) for yellow words and a right key (i.e., '/'-key) for blue words. For the depiction of an exemplary sequence of trials for the EAST see supplemental materials.

During the color task, we presented the word that participants had generated in the beginning of the study to summarize their personal obstacle of reality (i.e., reality word) along with two positive words (i.e., joy and glorious), two negative words (i.e., grief and painful), and one neutral word (i.e., impression). The white words were three strongly positively valenced words (i.e., fantastic, excellent, and magnificent) and three strongly negatively valenced words (i.e., horrible, dreadful, and gruesome). For a complete list of words, see supplemental materials.

Participants completed one practice block with 40 trials and 10 main blocks with 48 trials each. Within every block, each white word appeared 4 times and each colored word appeared 4 times (twice in yellow and twice in blue). The type of task (i.e., valence task versus color task) was chosen randomly on each trial. The experiment was run on a standard PC using MediaLab and DirectRT software. Stimuli were presented on a 19-inch CRT monitor, viewed at a distance of ~50 cm. Words were displayed in the center of the screen in white color (#FFFFFF), yellow

color (#FFFF00), or blue color (#4755FE), respectively. The font was Arial, bold, 24 pt. The rest of the screen showed a black background (#000000). The inter-trial interval was 0 milliseconds.

Reality evaluation index (REI). We computed a score to reflect participants' implicit evaluation of reality words, as well as of the neutral word (i.e., impression; Ferguson, 2008). We used only switch trials (i.e., all color trials that were preceded by at least one valence trial) because those trials should show larger compatibility effects and should therefore be most appropriate for measuring the implicit evaluations (e.g., Kiesel et al., 2010; Meiran, 2005, Voss & Klauer, 2007). We subtracted the median reaction times in trials using reality words displayed in yellow (i.e., same response key as positive white words) from the medians of reaction times in trials using reality words printed in blue (i.e., same response key as negative white words). This can be phrased as ([reality word with negative response] - [reality word with positive response]). The same computation was done for respective trials with the neutral colored word (i.e., [neutral word with negative response] - [neutral word with positive response]). We received a reality evaluation score and a neutral evaluation score, with lower scores indicating faster reaction times towards words paired with a negative (vs. positive) response. Thus, lower scores indicate a more negative implicit evaluation of the respective words. In order to create an index that reflected relative implicit evaluations of the colored reality words (adjusting for potential baseline evaluations of the neutral colored words), we subtracted the neutral evaluation scores from the reality evaluation scores (i.e., [reality evaluation score] - [neutral evaluation score]). This final reality evaluation index (REI) indicated the implicit evaluation of colored reality words above and beyond any baseline implicit evaluation of neutral colored words. Therefore, lower scores indicated a more negative implicit evaluation of the personal reality obstacle.

Results

Data Preparation

Reaction times were non-normally distributed, with skewness of 6.41 ($SE = 0.02$) and kurtosis of 182.74 ($SE = 0.04$). A Kolmogorov-Smirnov test indicates that the reaction times do not follow a normal distribution, $D(105469) = .20, p < .001$. To lessen the influence of outliers, we excluded six participants (3.95 %) with extreme error rates (i.e., ≥ 20 %; Wentura & Degner, 2010). Thus, data of 146 out of 152 (96.05 %) participants were included in the data analyses. Frequency of exclusion did not differ by manipulation of strategy, $\chi^2(2, N = 152) = 1.89, p = .39$. For reaction time analyses, we only used correct responses on the EAST. The error rate was 4.64 %.

Randomization

There were no significant differences between conditions in age, expectations of success, importance of success, or creative potential, $F_{\text{univariate}}(2,138) = .18$ to $1.31, ps > .27, \eta_p^2 < .02$, or gender, $\chi^2(2, N = 146) = .96, p = .62$, indicating that randomization was successful and there were no baseline differences on relevant measures.

Effects of Gender and Age

Interestingly, gender had a significant effect on the reality evaluation index, $F(1,144) = 4.12, p = .04, \eta_p^2 = .03$. Female participants displayed significantly lower reality evaluation indexes ($M = -96.18, SD = 131.60$), indicating greater negativity than male participants ($M = 22.58, SD = 149.64$), $F(1,144) = 56.49, p < .001, \eta_p^2 = .28$. Therefore, gender was added as a covariate when testing the effect of manipulation on the dependent variable. Age was not significantly correlated with the reality evaluation index, $r = -.14, p = .09$, and thus will not be further discussed.

Manipulation Check: Creativity as Desired Future

Only 50 participants (34.25 %) indicated a high importance of being successful on the upcoming creativity test, meaning that they indicated an importance of success higher than the midpoint of the scale (i.e., 4 on a scale from 1 to 7). Furthermore, 14 participants (9.59 %) indicated that being successful on the creativity test was not at all important to them (see Table 1 for descriptive analyses of the key measures).

Manipulation Check: Extrinsic Affective Simon Task (EAST)

Demonstrating that the EAST was able to measure implicit evaluations of negative and positive colored words, we also computed evaluation indexes for those trials with negative colored words, as well as for trials with positive colored words in the same way as for the REI. Larger scores indicate greater implicit positivity of colored words above and beyond baseline implicit evaluations of neutral colored words. A one-way repeated measures ANOVA confirmed that the negative evaluation index was significantly lower ($M = -96.18$ ms, $SD = 131.60$ ms), indicating greater negativity, compared to the positive evaluation index ($M = 22.58$ ms, $SD = 149.64$ ms), $F(1,145) = 110.34$, $p < .001$, $\eta_p^2 = .43$.

Dependent Variable: Implicit Evaluation of the Obstacle

As in Study 1, we predicted that mental contrasting (versus control conditions) changes participants' implicit evaluation of their idiosyncratic obstacle in line with their expectations of success. Only for participants in the mental contrasting condition, the higher their expectations of success were, the more negative their implicit evaluation of their idiosyncratic obstacle should be (i.e., lower REI). To test our prediction, we specified hierarchical multiple regression analyses using model 1 of the SPSS PROCESS macro provided by Hayes (2013). We entered REI as a dependent variable, expectations of success as an independent continuous variable, and condition as a multi-categorical moderator. This option created two dummy-coded variables, with Dummy

1 coding the reverse contrasting condition as 1, and Dummy 2 coding the distraction control condition as 1. As gender had a significant effect on the REI, it was entered as a covariate into the analysis.

As predicted, adding the two interaction terms of expectations and the Dummy variables significantly improved the model, $R^2_{\text{change}} = 5.39\%$, $F_{\text{change}}(2,139) = 4.17$, $p = .01$. Only for participants in the mental contrasting condition, the REIs were predicted by expectations of success, $\beta = -46.56$, $t(139) = 2.63$, $p = .01$. A bias-corrected bootstrap confidence interval for the conditional effect based on 5,000 bootstrap samples was entirely below zero (-81.570 to -11.546). Replicating the results from Study 1, higher expectations of success again predicted lower, more negative REIs. Once more, we did not find a relation between expectations of success and REIs in the reverse contrasting condition, $\beta = 4.38$, $t(139) = .26$, $p = .79$, or in the distraction control condition, $\beta = 23.36$, $t(139) = 1.24$, $p = .22$. The link between expectations of success and REI was stronger in the mental contrasting condition than in the reverse contrasting control condition, $t(139) = 2.09$, $p = .04$, and stronger than in the distraction control condition, $t(139) = 2.76$, $p = .007$ (Figure 2).²

Discussion

Study 2 replicated the results of Study 1. Again, only in the mental contrasting condition compared with the other two conditions, there was a relation between participants' expectations of success and their implicit evaluations of their obstacle of current reality. Participants in the

² We also computed REIs by using means and the usual cutoff of 3 standard deviations from the mean. We found that adding the two interaction terms of expectations and the Dummy variables did not significantly improve the model, $R^2_{\text{change}} = 2.68\%$, $F_{\text{change}}(2,139) = 2.10$, $p = .13$. We also found that the link between expectations of success and REI was not significantly stronger in the mental contrasting condition than in the reverse contrasting control condition, $t(139) = .95$, $p = .34$. However, we found that it was stronger in the mental contrasting condition than in the distraction control condition, $t(139) = 2.05$, $p = .04$. In line with these results, we observed that compared to Study 1, the REI ranges in Study 2 included more extreme values (Study 2 REI median range: 715ms, *min*: -348ms, *max*: 367ms vs. REI mean range: 1256ms, *min*: -668ms, *max*: 588ms). We reason that the partly non-significant findings (when using means rather than medians in the analyses) should be a consequence of mean RT analyses being more influenced by extreme values, whereas the median RT analyses are more robust against those influences.

mental contrasting condition displayed more negative implicit evaluations of their idiosyncratic obstacle (i.e., lower REI) as their expectations of success increased. This finding indicates that mental contrasting participants with high expectations of succeeding in the upcoming creativity test evaluated their reality as a comparatively negative obstacle that needs to be overcome.

In contrast to Study 1, in Study 2 all participants elaborated on the same desired future (i.e., to successfully solve an upcoming creativity test) and expectations of success were measured. Importantly, we replicated our findings by employing another paradigm to measure the implicit evaluations of the generated obstacle (i.e., the EAST) and recruiting a participant sample with a different cultural background (i.e., United States of America). Taken together, the first two studies support the idea that mental contrasting modulates implicit evaluations of the obstacle depending on expectations of success. To examine whether mental contrasting may achieve its beneficial effects on energization and performance through this change in implicit evaluations of the obstacle, we conducted Study 3.

In addition, a limitation of Study 2 was that successfully solving the creativity test was not a highly-desired future for participants. Only 34.25 % of participants indicated a high importance of successfully solving the creativity test (i.e., higher than 4 on a scale from 1 to 7). In Study 3, we therefore sought to replicate our findings utilizing a potentially more desirable future (i.e., to improve one's eating habits). Furthermore, to restrict the type of obstacle participants named, in Study 3, we asked participants to name their most critical food temptation. In contrast to Studies 1 and 2, this obstacle of reality should carry a positive valence. We again measured participants' expectations of success and thereafter assigned participants to the experimental conditions (i.e., a mental contrasting condition, a reverse contrasting condition, and a distraction control condition). To replicate our findings with yet another paradigm, we

employed an affective priming task to measure implicit evaluations in Study 3. Importantly, we investigated participants' implicit evaluations as a potential mediator of mental contrasting effects on subsequent feelings of energization and performance.

Study 3: Healthy Eating

Students were invited to participate in a study about healthy eating. Similar to Study 2, all participants elaborated on the same desired future (i.e., improving one's eating habits) and indicated their expectations of success. Contrary to Studies 1 and 2, participants named an obstacle of reality that should per se carry a positive valence (i.e., their most critical food temptation). Participants were then randomly assigned to either a mental contrasting condition, a reverse contrasting condition, or a distraction control condition.

As first dependent variable, we assessed participants' implicit evaluation of their idiosyncratic obstacle, using an unmasked version of the affective priming task (e.g., Ferguson & Bargh, 2004). As further dependent variables, we assessed participants' feelings of energization as well as their commitment to eat more healthily (i.e., via feelings of anticipated disappointment; Kappes, H. B. & Oettingen, 2011; Oettingen et al., 2001). Finally, we assessed participants' actual performance. Specifically, participants' eating behavior was assessed via an online daily nutrition diary over two weeks.

We hypothesized that only participants in the mental contrasting condition (versus control conditions) would show changes in their implicit evaluations of the obstacle depending on expectations of success. Again, we expected that only participants in the mental contrasting condition (versus control conditions) would subsequently show a more negative implicit evaluation of their idiosyncratic obstacle as their expectations of success increased. Importantly, in this study, we further predicted that, for mental contrasting participants (versus control

participants), the implicit evaluation of their obstacle would predict their feelings of energization and, in turn, their goal commitment and performance (i.e., their commitment to eat more healthily as well as their healthy eating over the course of two weeks).

Method

Participants

Participants were 160 students (136 women, $M_{\text{age}} = 20.4$ years, $SD_{\text{age}} = 1.2$ years, age range: 17–23 years), after we had excluded 59 participants who did not identify their first language as English. Within our final sample, all participants identified their first language as English. Participants were randomly assigned to either a mental contrasting condition ($n = 47$), a reverse contrasting condition ($n = 51$), or a distraction control condition ($n = 62$). The study took place at a large university in the United States of America. The study duration was approximately 20 minutes for the first session. Completing the daily diary took approximately 5 minutes per day, adding up to approximately 70 minutes overall. Participants received partial course credit as compensation.

We conducted a sensitivity power analysis in order to determine the minimal detectable effect that could be obtained within our study design for three groups. We recruited 160 participants. The sensitivity power analysis indicated that, given 80% power ($1 - \beta$) at a .05 alpha level ($\alpha = .05$), the minimal detectable effect size for our experimental manipulation would be $d = 0.50$.

Procedure and Measures

Participants learned that this study was about changing one's eating habits. They read that they would answer questions about their thoughts on eating habits, and that they would complete a nutrition diary over the course of the upcoming two weeks. In the beginning of the study,

participants provided their email addresses, which were needed for follow-up invitations to the nutrition diaries and stored separately to ensure the anonymity of participants' answers.

Furthermore, participants created an anonymous personal code to enable the matching of data from the experimental lab session with data from the nutrition diary.

Expectations of success and baseline measures. Participants indicated how likely they thought it was that they would successfully improve their eating habits (i.e., expectations of success) on a Likert scale from 1 (*not at all*) to 7 (*very*). Furthermore, to see if improvement of eating habits was in fact a desired future for participants, they indicated how important it was to them that they would successfully improve their eating habits (i.e., importance of success) on a Likert scale from 1 (*not at all*) to 7 (*very*). They also indicated how much they would like to improve their eating habits (i.e., extent of wanting to eat more healthily) on a Likert scale from 1 (*not at all: They are fine the way they are*) to 7 (*very much: I would like to improve them drastically*).

To ensure that participants in the experimental groups did not differ in relevant variables, we included the following measures. Participants indicated how confident they were that they could successfully improve their eating habits (i.e., self-efficacy expectations) on a Likert scale from 1 (*not at all*) to 7 (*very*). Furthermore, participants completed the restraint eating subscale from the Dutch Eating Behavior Questionnaire (Van Strien, Frijters, Bergers, & Defares, 1986). The restraint eating subscale consisted of 10 questions (e.g., Do you deliberately eat less in order to not become heavier? Cronbach's $\alpha = .91$). All questions were answered on a Likert scale with the following options: 1 (*never*), 2 (*seldom*), 3 (*sometimes*), 4 (*often*), and 5 (*very often*). Furthermore, participants also answered the question "Do you eat when you are stressed, angry, or bored?" (i.e., emotional eating), using the same Likert scale options as above. Finally, general

self-control was assessed using the Brief Self-Control Scale (BSCS; Tangney, Baumeister, & Boone, 2004). The scale consisted of thirteen questions (e.g., I refuse things that are bad for me; Cronbach's $\alpha = .82$). All questions were answered on a Likert scale ranging from 1 (*not at all*) to 5 (*very much*).

In order to test whether our manipulation affected healthy eating beyond baseline healthy eating behavior, participants described what they ate on a typical day of the past two weeks. This procedure was modified from the daily drinking questionnaire (Collins, Parks, & Marlatt, 1985). Participants described in detail (including the amount in cups, grams, ounces, etc.) what they ate for breakfast, as a snack after breakfast, lunch, as a snack after lunch, dinner, and as a snack after dinner. To receive an objective indicator of healthy eating behavior, two independent raters that were blind to hypotheses and conditions evaluated the healthiness of eating (i.e., baseline healthy eating). Raters assigned an overall grade for the healthiness of eating on a Likert scale ranging from 1 (*very unhealthy*) to 6 (*very healthy*). They considered the consumption of fatty and sugary food, of fruit and vegetables, and of alcohol. As a measure for inter-rater reliability, we computed an intraclass correlation coefficient. The average measure ICC was .61, 95 % CI [0.47, 0.72], $F(155, 155) = 2.56$, $p < .001$. We used the averaged measure of both raters for analyses. Finally, as stress might have an impact on eating behavior, participants indicated their level of stress during the past 2 weeks (i.e., baseline perceived stress), on a Likert scale ranging from 1 (*The past two weeks were a lot less stressful than usual*), to 4 (*The past two weeks were regularly stressful*), to 7 (*The past two weeks were a lot more stressful than usual*).

Obtaining words for the affective priming task. To obtain words for use in the affective priming task, participants named their most important and critical obstacle of reality (e.g., their most critical food temptation) that could prevent them from successfully improving

their eating habits within the next two weeks. Thereafter, they specified one word to summarize their idiosyncratic obstacle of reality. Examples included “fries” and “chocolate”.

Manipulation of self-regulation strategy. As an introduction, participants read that the study was designed to learn more about their thoughts about improving their eating habits. We told them to take their time and express their thoughts as they come to mind. As in Studies 1 and 2, to manipulate participants’ self-regulation strategy, they received varying instructions depending on the condition. Hence, participants were randomly assigned to either a mental contrasting condition, a reverse contrasting condition, or a distraction control condition. Participants in the mental contrasting condition elaborated and wrote about the most wonderful outcome they associated with successfully improving their eating habits, before elaborating how their most critical food temptation (i.e., their obstacle of reality) could prevent them from successfully improving their eating habits. Participants in the reverse contrasting control condition elaborated the same aspects, but in reverse order. Thus, they started with mentally elaborating and writing about how their most critical food temptation (i.e., their obstacle of reality) could prevent them from successfully improving their eating habits, followed by mentally elaborating and writing about the most wonderful outcome they associated with successfully improving their eating habits. Participants in the distraction control condition worked on arithmetic problems modified from Düker’s (1949) “Concentration Achievement Test” (*Konzentrations-Leistungs-Test, KLT*; Düker & Lienert, 1965).

Dependent variable: Implicit evaluation of the obstacle. To assess participants’ implicit evaluation of their idiosyncratic food temptation, they completed an affective priming task (Ferguson & Bargh, 2004). Each trial consisted of a prime word for 150 milliseconds, a blank screen for 150 milliseconds, and a target word. The target word lasted on the screen until

participants indicated whether each target seemed positive or negative. It should be noted that, in contrast to Study 1, we did not use forward or backward masking. Therefore, participants could consciously process the primes. We instructed participants to ignore the prime word and indicate as quickly and accurately as possible whether each target word was positive or negative.

Participants pressed the right key (i.e., '/'-key) for negative and the left key (i.e., 'z'-key) for positive target words. For the depiction of an exemplary trial for the unmasked affective priming task see supplemental materials. As primes, we presented the words that participants had generated in the beginning of the study to summarize their idiosyncratic food temptation (i.e., reality prime), along with neutral primes (e.g., area, aspect, or board). As this measure has been used and validated with the same stimuli words that we used (i.e., the same neutral prime words, positive and negative target words; Ferguson & Bargh, 2004), we did not include a manipulation check to demonstrate that the paradigm was able to distinguish between positive and negative primes. Target words were strongly positively valenced words (e.g., appealing, attractive, or beautiful) and strongly negatively valenced words (e.g., awful, disgusting, or despicable). For a complete list of prime words and target words, see supplemental materials.

Participants completed 2 blocks with 40 trials each. Within every block, each prime appeared twice with a positive target word and twice with a negative target word. Sampling without replacement was used to select the neutral primes, positive targets and negative targets. The experiment was run on a standard PC using MediaLab and DirectRT software. Stimuli were presented on a 19-inch CRT monitor, viewed at a distance of ~50 cm. Prime words and target words were displayed in white color (#FFFFFF) in the center of the screen. The font was Arial, bold, 24pt. The rest of the screen showed a black background (#000000). The inter-trial interval was 1000 milliseconds.

Reality evaluation index (REI). To obtain a measure of implicit evaluations of the idiosyncratic food temptation, we computed the same reality evaluation index (REI) as in Study 1 (Ferguson, 2008). We subtracted median reaction times in trials using idiosyncratic food temptation primes and positive targets from median reaction times in trials using idiosyncratic food temptation primes and negative targets (i.e., [reality prime & negative target] - [reality prime & positive target]). The same computation was done for respective trials with neutral primes (i.e., [neutral prime & negative target] - [neutral prime & positive target]). We received a reality evaluation score and a neutral evaluation score, with lower scores indicating faster reaction times towards negative (vs. positive targets) preceded by the respective primes. Thus, lower scores indicate a more negative implicit evaluation of the respective primes. Again, in order to create an index that reflected relative implicit evaluations of the food temptation prime adjusting for potential baseline evaluations of neutral primes, we subtracted neutral evaluation scores from reality evaluation scores (i.e., [reality evaluation score] - [neutral evaluation score]). This final reality evaluation index (REI) indicated implicit evaluations of reality primes above and beyond any baseline implicit evaluations of neutral primes. Hence, lower scores indicate a more negative implicit evaluation of the idiosyncratic food temptation.

Dependent variable: Feelings of energization. Participants reported their feelings of energization by indicating how active, motivated, and enthusiastic they felt with respect to improving their eating habits over the next two weeks (Cronbach's $\alpha = .92$; Kappes, H. B., & Oettingen, 2011). All questions were answered on a Likert scale from 1 (*not at all*) to 7 (*very*).

Dependent variable: Commitment to eat more healthily. As an indicator of goal commitment (i.e., commitment to improve one's eating habits), participants answered three questions about their anticipated disappointment (Cronbach's $\alpha = .93$, see also Oettingen et al.,

2001). Participants indicated how disappointed, frustrated, and upset they would be if they did not improve their eating habits over the next two weeks. All questions were answered on a Likert scale from 1 (*not at all*) to 7 (*very*).

Dependent variable: Healthy eating over two weeks. As an indicator of performance, participants completed a nutrition diary over two weeks after participating in the study. Participants received a link to an online questionnaire via email every day in the late afternoon, which they were instructed to complete after having their last meal of the day. Questions were the same as for the assessment of baseline eating behavior. Participants wrote down everything they ate that day for breakfast, for between breakfast and lunch, lunch, between lunch and dinner as well as dinner and nighttime. Importantly, as an objective indicator of eating behavior, two independent raters blind to hypotheses and conditions again evaluated the healthiness of eating (i.e., healthy eating over two weeks). For each day, raters assigned an overall grade for the healthiness of eating on a 6-point scale ranging from 1 (*very unhealthy*) to 6 (*very healthy*). They considered the consumption of fatty and sugary food, of fruit and vegetables, and of alcohol. We calculated mean eating grades across the 14 days of the two weeks, such that higher values indicated healthier eating behavior. As a measure for inter-rater reliability, we computed an intraclass correlation coefficient. The average measure ICC was .80, 95 % CI [0.73, 0.86], $F(157,157) = 5.13, p < .001$. We used the averaged measure of both raters for analyses. On the last day of the two weeks, participants indicated their level of stress over the past two weeks (i.e., follow-up perceived stress) on a Likert scale ranging from 1 (*The past two weeks were a lot less stressful than usual*), to 4 (*The past two weeks were regularly stressful*), to 7 (*The past two weeks were a lot more stressful than usual*). Lastly, participants were debriefed and thanked.

Results

Data Preparation

Reaction times were non-normally distributed, with skewness of 27.77 ($SE = 0.02$) and kurtosis of 1009.30 ($SE = 0.03$). A Kolmogorov-Smirnov test indicates that the reaction times do not follow a normal distribution, $D(21797) = .38, p < .001$. To lessen the influence of outliers, we excluded 13 participants (7.51%) with extreme error rates (i.e., $\geq 20\%$; Wentura & Degner, 2010). Thus, data of 160 out of 173 (92.49%) participants were included in the data analyses. Frequency of exclusion did not differ by manipulation of strategy, $\chi^2(2, N = 173) = 1.11, p = .57$. For reaction time analyses, we only used correct responses on the affective priming task. The error rate was 4.77 %.

Randomization

There were no significant differences between conditions in gender, $\chi^2(2, N = 160) = 1.25, p = .54$, age, expectations of success, importance of success, extent of wanting to eat more healthily, self-efficacy expectations, restraint eating, emotional eating, self-control, baseline healthy eating, or baseline perceived stress, $F_{\text{univariate}}(2, 150) = .17$ to $2.10, ps > .13, \eta_p^2 < .03$, indicating that randomization was successful and there were no baseline differences on relevant measures.

Effects of Gender and Age

Gender had a significant effect on commitment, $F(1, 153) = 5.15, p = .03, \eta_p^2 = .03$, and healthy eating over two weeks, $F(1, 153) = 6.04, p = .02, \eta_p^2 = .04$. Female participants reported higher commitment ($M = 3.98; SD = 1.54$) than male participants ($M = 3.17; SD = 1.70$), and healthier eating over two weeks ($M = 4.07; SD = .70$) than male participants ($M = 3.70; SD = .48$). Therefore, gender was added as a covariate when testing the effects of manipulation on the respective dependent variables. In contrast, gender did not have a significant effect on the reality

evaluation index, $F(1, 153) = .79, p = .38, \eta_p^2 = .005$, or feelings of energization, $F(1, 153) = .65, p = .42, \eta_p^2 = .004$. Furthermore, age was not significantly correlated with the reality evaluation index, $r = -.07, p = .41$, feelings of energization, $r = -.04, p = .66$, commitment to eat more healthily, $r = .08, p = .35$, or healthy eating over two weeks, $r = .11, p = .16$, and therefore will not be further discussed.

Manipulation Check: Healthy Eating as a Desired Future

Out of 160 participants, 104 participants (65 %) indicated a high importance of successfully improving their eating habits, meaning that they indicated an importance of success higher than the midpoint of the scale (i.e., 4 on a scale from 1 to 7). Only two participants (1.25 %) indicated that improving their eating habits was not at all important to them. Furthermore, 105 participants (65.63 %) indicated that they wanted to improve their eating habits to a high extent, meaning they indicated an extent higher than the midpoint of the scale (i.e., 4 on a scale from 1 to 7). Similarly, only four participants (2.50 %) indicated they did not want to improve their eating habits at all (see Table 2 for descriptive analyses of the key measures).

Dependent Variable: Implicit Evaluation of the Obstacle

As in Studies 1 and 2, we predicted that only for participants in the mental contrasting condition, the higher their expectations of success were, the more negative their implicit evaluation of their idiosyncratic obstacle would be (i.e., lower REI). To test our prediction, we specified hierarchical multiple regression analyses using Model 1 of the SPSS PROCESS macro provided by Hayes (2013). We entered REI as the dependent variable, expectations of success as an independent continuous variable, and condition as a multi-categorical moderator. This option created two dummy-coded variables, with Dummy 1 coding the reverse contrasting condition as 1, and Dummy 2 coding the distraction control condition as 1. As predicted, adding the two

interaction terms between expectations and the two Dummy variables significantly improved the model, $R^2_{\text{change}} = 4.13\%$, $F_{\text{change}}(2,152) = 3.28$, $p = .04$. Only for participants in the mental contrasting condition, expectations of success predicted reality evaluation indexes, $\beta = -22.43$, $t(152) = 2.13$, $p = .04$. A bias-corrected bootstrap confidence interval for the conditional effect, based on 5,000 bootstrap samples, was entirely below zero (-43.239 to -1.599). Replicating results from Studies 1 and 2, higher expectations of success again predicted lower, more negative reality evaluation indexes. Once more, we did not find a relation between expectations of success and REIs in the reverse contrasting condition, $\beta = 11.81$, $t(152) = 1.21$, $p = .23$, or in the distraction control condition, $\beta = 8.24$, $t(152) = .75$, $p = .45$. The link between expectations of success and the REI was stronger in the mental contrasting condition than in the reverse contrasting condition, $t(152) = 2.39$, $p = .02$, and stronger than in the distraction control condition, $t(152) = 2.02$, $p = .04$ (Figure 3).³

Mental Contrasting: Expectancy-Dependent Implicit Evaluation of the Obstacle Predicts Feelings of Energization and Translates into Commitment and Performance

Next, we tested our prediction that implicit evaluations of the obstacle would mediate mental contrasting effects on energization and then commitment and performance. We predicted that only for participants in the mental contrasting condition (but not in the control conditions) should expectations of success indirectly predict commitment to eat more healthily and healthy eating over two weeks through their relation to implicit evaluations of the obstacle and feelings

³ We also computed REIs by using means and the usual cutoff of 3 standard deviations from the mean. We found that adding the two interaction terms of expectations and the Dummy variables did not significantly improve the model, $R^2_{\text{change}} = 2.75\%$, $F_{\text{change}}(2,148) = 2.12$, $p = .12$. However, we found that the link between expectations of success and REI was marginally stronger in the mental contrasting condition than in the reverse contrasting control condition, $t(148) = 1.85$, $p = .07$ and also marginally stronger than in the distraction control condition, $t(148) = 1.71$, $p = .09$. Again, compared to Study 1, the REI ranges in Study 3 included more extreme values (Study 3 REI median range: 780ms, *min*: -424ms, *max*: 356ms vs. REI mean range: 883ms, *min*: -350ms, *max*: 532ms), and median RT analyses are more robust against such extreme values.

of energization. As commitment to eat more healthily and healthy eating over two weeks differed across gender, gender was added as a covariate in the respective analyses.

Serial multiple mediator analyses: Commitment to eat more healthily. As predicted, serial multiple mediator analyses using ordinary least squares path analyses (Model 6 in the PROCESS macro; Hayes, 2013) revealed a significant indirect relation between expectations of success and commitment to eat more healthily ($adb = .038$) through the REI and feelings of energization for participants in the mental contrasting condition (see Figure 4A). A bias-corrected bootstrap 95% confidence interval for the indirect relation based on 5,000 bootstrap samples did not include zero (.001 to .167).

In line with our hypothesis, for participants in the reverse contrasting condition, there was no indirect relation between expectations of success on commitment to eat more healthily ($adb = -.004$) via the REI and feelings of energization (see Figure 4B). A bias-corrected bootstrap 95% confidence interval for the indirect relation based on 5,000 bootstrap samples included zero (-.053 to .006). Similarly, for participants in the distraction control condition, there was also no indirect relation between expectations of success and commitment to eat more healthily ($adb = -.003$) via the REI and feelings of energization (see Figure 4C). A bias-corrected bootstrap 95% confidence interval for the indirect relation based on 5,000 bootstrap samples included zero (-.041 to .003).

In sum, in line with our prediction, we observed a significant indirect relation between expectations of success and commitment to eat more healthily through the REI and feelings of energization in the mental contrasting condition. That is, participants who mentally contrasted and who had high expectations of eating more healthily displayed a more negative implicit evaluation of their idiosyncratic obstacle of reality. This negative implicit evaluation predicted

increased feelings of energization, which, in turn, translated into commitment to eat more healthily within the upcoming two weeks. This indirect relation was not significant for participants in the two control conditions.

Serial multiple mediator analyses: Healthy eating over two weeks. As predicted, serial multiple mediator analyses using ordinary least squares path analyses (Model 6 in the PROCESS macro; Hayes, 2013) revealed a significant indirect relation between expectations of success and healthy eating over two weeks ($adb = .020$) through the REI and feelings of energization for participants in the mental contrasting condition (see Figure 5A). A bias-corrected bootstrap 95% confidence interval for the indirect relation based on 5,000 bootstrap samples did not include zero (.001 to .082).

In line with our hypothesis, for participants in the reverse contrasting condition, there was no indirect relation between expectations of success and healthy eating over two weeks ($adb = .001$) via the REI and feelings of energization (see Figure 5B). A bias-corrected bootstrap 95% confidence interval for the indirect relation based on 5,000 bootstrap samples included zero (-.006 to .007). Similarly, for participants in the distraction control condition, there was also no indirect relation between expectations of success and healthy eating over two weeks ($adb = .001$) via the REI and feelings of energization (see Figure 5C). A bias-corrected bootstrap 95% confidence interval for the indirect relation based on 5,000 bootstrap samples included zero (-.001 to .019).

In sum, we observed a significant indirect relation between expectations of success on healthy eating over two weeks through the REI and feelings of energization in the mental contrasting condition. That is, participants who mentally contrasted and who had high expectations of eating more healthily displayed a more negative implicit evaluation of their

idiosyncratic obstacle of reality. This negative implicit evaluation predicted increased feelings of energization, which, in turn, translated into actual healthy eating in the upcoming two weeks.

This indirect relation was not significant for participants in the two control conditions.

Discussion

Study 3 replicated the results of Studies 1 and 2. Again, only in the mental contrasting condition and not in the control conditions, we found a significant relation between expectations of success and implicit evaluations of the obstacle. For participants in the mental contrasting (vs. control conditions), the higher their expectations of success were, the more negative were their implicit evaluations of their idiosyncratic obstacle (i.e., lower REI). Further, in Study 3, for mental contrasting participants, changes in implicit evaluations of the obstacle mediated the relation between expectations, feelings of energization, and goal commitment and performance. That is, a person who mentally contrasted their best outcome of successfully improving their eating habits with their most critical food temptation (e.g., hamburgers), thereafter displayed a more negative implicit evaluation of this food temptation. This negative implicit evaluation, in turn, predicted increased feelings of energization to eat more healthily, which then translated into heightened commitment to eat more healthily and actual healthy eating over two weeks.

We replicated our findings in a third domain (i.e., healthy eating), employing another paradigm to measure implicit evaluations (i.e., affective priming task) and using a different type of obstacle of reality that presumably carried a positive valence per se (i.e., a personal food temptation). Taken together, these findings further support our notion that mental contrasting modulates implicit evaluations of the obstacle depending on expectations of success. Moreover, Study 3 provides evidence that mental contrasting leads to changes in energization via changes in

the implicit evaluation of the obstacle of current reality. Changes in energization, in turn, predicted heightened commitment and performance.

General Discussion

The present research investigated implicit evaluations of the obstacle of reality as a potential mechanism of mental contrasting effects on energization and performance. Results of three studies demonstrate that mental contrasting modulated participants' implicit evaluation of their personal obstacle of reality in line with their expectations of success. Using mental contrasting (vs. relevant control conditions) resulted in a more negative implicit evaluation of personal obstacle of reality as expectations of success increased. These results applied to wishes related to interpersonal relationships (Study 1), to wishes related to creativity (Study 2), and to wishes related to healthy eating (Study 3). Expectations of success were manipulated (Study 1) and measured (Study 2 and Study 3). Furthermore, we replicated the results using three different measures of implicit evaluations, employing a masked affective priming task (Study 1) and an unmasked affective priming task (Study 3), as well as an extrinsic affective Simon task (Study 2). Moreover, the results were replicated in the German language (Study 1) and the English language (Study 2 and Study 3). Importantly, Study 3 provides evidence for the mediating role of implicit evaluations of obstacle for the effects of mental contrasting on feelings of energization and performance (i.e., commitment to eat more healthily and healthy eating over two weeks).

Alternative Explanations

Across all three studies, in neither the valence control condition, the distraction control condition, nor the reverse contrasting condition did expectations of success predict implicit evaluations of the obstacle. Comparing the results of the control conditions excludes several alternative explanations. For instance, one might argue that any elaboration of a positive

followed by a negative content would modulate implicit evaluations of the obstacle of reality in line with one's expectations of success. However, the results of the valence control condition in which participants first elaborated on a positive experience followed by a negative experience do not support this prediction.

Furthermore, one might argue that any elaboration of both the desired future and the reality would modulate implicit evaluations of the obstacle of reality in line with one's expectations of success. However, the results of the reverse contrasting condition do not support this prediction. Therefore, we may assume that the order of mental elaboration plays a crucial role. These results imply that the elaboration of the obstacle of reality before the best outcome did not emphasize that the obstacle of reality impeded the realization of the desired future (see also Oettingen, 2012).

Further, one might argue that the reverse contrasting control condition diminished the relationship between expectations of success and implicit evaluations of the personal obstacle, rather than mental contrasting establishing this relationship. However, the results of the valence control condition and the distraction control condition, in which no manipulation was carried out, displayed the same pattern as the reverse contrasting control condition.

Lastly, one may argue that merely ending one's mental elaborations with the obstacle would modulate subsequent implicit evaluations of the obstacle. However, previous research has found that dwelling on the obstacle of reality does not lead to expectancy-dependent behavior (e.g., Oettingen et al., 2001; Oettingen, Mayer, & Thorpe, 2010; summary by Oettingen, 2012). In conclusion, only when the obstacle of current reality is elaborated *in the context* of the desired future does this modulate the implicit evaluation towards this obstacle based on expectations of success.

Importantly, only in the mental contrasting condition did the implicit evaluation of obstacle of reality predict feelings of energization, and, in turn, performance. Thus, the present findings support our initial idea that mental contrasting paired with high expectations of success establishes a negative instantaneous response (i.e., implicit evaluation) toward the personal obstacle (such as one's messiness, nervousness, or eating a hamburger). This implicit evaluation, in turn, helps people to understand how the reality prevents them from realizing their desired future, thereby energizing them to commit to and strive for this future.

Limitations

One concern might relate to the use of idiosyncratic words. In all three studies, we measured implicit evaluations of idiosyncratic reality words that participants had previously named. Hence, systematic differences in the idiosyncratic reality words between the conditions might explain the reported findings. However, we argue that potential differences in these idiosyncratic reality words cannot explain our results, as participants were randomly assigned to the different conditions *after* they named these reality words.

One other concern might relate to our measures of feelings of energization and commitment in Study 3. Specifically, one might argue that how active, motivated, and enthusiastic one feels about eating healthy is not all that different from how disappointed, frustrated, and upset one would be about not eating healthy. Thus, those questions might reflect the same overlapping concept, namely commitment to eat more healthily. However, previous research on mental contrasting has shown that energization as measured by both physiological measures and self-report measures is a mechanism that mediates mental contrasting effects on commitment (e.g., Oettingen et al., 2009; Sevincer, Busatta, & Oettingen, 2014; see also Wright & Gendolla, 2012). In line with this research, we tested our model with self-reported

energization being a predictor for goal commitment and actual behavior. In fact, when we changed the order of our mediators, the model was not significant, $adb = .004$, 95% CI $[-.017, .043]$. Also, the correlation between our measures of feelings of energization and commitment was $r = .28$, $p < .001$, speaking to the argument that our measures of energization and commitment do not assess the same construct. Future studies should replicate our findings that mental contrasting impacts energization via implicit obstacle evaluations using physiological measures of energization (e.g., SBP; Oettingen et al., 2009, Study 1; see also Wright, 1996; Wright & Kirby, 2001). Similarly, one could measure energization by squeezing a handgrip or other measures of physical stamina (see Sevincer et al., 2014). Performance on such tasks heavily hinge on the mobilization of energy (Hutchinson, Sherman, Martinovic, & Tenenbaum, 2008). One last important concern relates to the relatively small sample sizes we recruited throughout our studies. Although our sensitivity analyses indicate that medium effect sizes could be detected in our studies, the yielded power was relatively low (i.e., 80 %). Future studies should replicate the present findings in larger, more representative participant samples.

Implications for Research on Fantasy Realization Theory

Our findings expand prior research on fantasy realization theory (Oettingen, 2000), which have alluded to the critical role of obstacles of reality for the effects of mental contrasting on energization and performance. For instance, when paired with high (vs. low) expectations of success, mental contrasting strengthened the meaning of the reality as an obstacle (Kappes, A. et al., 2013). These changes then mediated mental contrasting effects on subsequent performance (e.g., exam preparation, feelings of responsibility). Furthermore, mental contrasting paired with high (vs. low) expectations of success established strong mental associations between the obstacle of reality and behaviors instrumental in overcoming the impeding reality (Kappes, A.,

Singmann, & Oettingen, 2012). These obstacle–behavior associations created by mental contrasting in turn predicted respective performance. Extending these previous findings, the present research underscores the notion that obstacles play a pivotal role for the effects of mental contrasting. We showed that mental contrasting with high (vs. low) expectations of success led people to form a negative implicit evaluation of their obstacle of current reality, which, in turn, predicted energization and performance. When expectations of success were high, a negative implicit evaluation of the obstacle of reality provided the necessary energy that helped mental contrasting participants to overcome their obstacle, thereby promoting performance. In contrast, when expectations of success were low, mental contrasting participants showed a less negative implicit evaluation of the obstacle of reality, indicating that the reality was understood as unlikely to be overcome (i.e., no longer understood as an obstacle). Thus, people no longer felt energized or committed to realize their desired future.

Implications for Research on Automatic Goal Pursuit

Our findings are in line with and extend previous research on automatic goal pursuit (Moskowitz, Li, & Kirk, 2004). Not only the activation of a goal (e.g., Aarts & Dijksterhuis, 2000; Aarts, Gollwitzer, & Hassin, 2004; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001; Chartrand & Bargh, 1996, Shah & Kruglanski, 2002), but also goal pursuit itself may occur automatically (e.g., Bargh et al., 2001; Custers & Aarts, 2005; McCulloch, Ferguson, Kawada, & Bargh, 2008). For instance, the presence of a goal prime (e.g., diet) led to an automatic cognitive inhibition of temptations (e.g., chocolate), suggesting that successful goal pursuit might be linked to automatic behaviors (e.g., building habits) to avoid temptations (Fishbach et al., 2003). Relying on automatic behaviors rather than controlled and effortful processes to actively battle temptations might save the energy and effort that would be necessary

to resist them. Contributing to this previous research on automatic goal pursuit, our findings demonstrate that self-regulation processes established by mental contrasting operate in an implicit fashion (i.e., effortless and non-consciously) and mediate goal pursuit (Kappes, A., & Oettingen, 2014; Kappes, A. et al., 2012; Kappes, A. et al., 2013). Hence, mental contrasting enables people to self-regulate without that they are even aware, and thus it may be a viable way to self-regulation without depleting their mental efforts and other motivational resources (Muraven & Baumeister, 2000).

Implications for Research on Implicit Evaluations

Finally, our findings contribute to previous research on implicit evaluations. Stimuli or objects of the environment are found to automatically activate positive or negative evaluations (Custers & Arts, 2005; Ferguson, 2007; Ferguson & Bargh, 2004). Such implicit evaluations enable people to quickly detect signs of threat or reward (without effort and awareness) and to act accordingly (e.g., Fazio, 1989; Roskos-Ewoldsen & Fazio, 1992). Importantly, recent research showed that even the evaluation of morality and immorality traits, which was so far considered to be stable and context-independent, depends on how one's current goals are best served. That is, when immorality serves one's current goal, the positive evaluation of others' moral (vs. immoral) traits can be eliminated or even reversed (Melnikoff & Bailey, 2018). In the context of goal pursuit, activated goals lead to a more negative implicit evaluation of temptations (e.g., alternative short-term goals; Fishbach et al., 2010; Fujita & Han, 2009). One might argue that these results contradict our results as they find a negative implicit evaluation of temptations in the absence of mental contrasting. Importantly, in the reported studies, the authors recruited participants who were already committed to their goal prior to entering the studies (e.g., dieters). They then activated those goals (e.g., via priming). In contrast, in our studies, we randomly

recruited participants and harnessed mental contrasting to turn desired futures into goal commitments in line with participants' expectations of success. Thus, only participants who mentally contrasted and who had high expectations of success thereafter showed more negative implicit evaluations of their obstacles, which, in turn, predicted their goal commitment. Only those participants had formed binding goals (see Kappes, A. & Oettingen, 2014). Our findings are consistent with this research on goal pursuit, as they suggest that the self-regulation strategy of mental contrasting turned positive fantasies about participants' desired futures into binding goals and thus achieved its effects on goal-directed performance by modulating implicit evaluations of the obstacle of reality.

Moreover, research in the area of obesity suggests that implicit evaluations of unhealthy palatable foods can be changed via several sessions of response inhibition trainings, in which unhealthy palatable foods are paired with behavioral stop signals. The training, in turn, reduced intake of unhealthy palatable foods after the experiment (Veling, Aarts, & Stroebe, 2013). Similar response inhibition trainings have been shown to reduce food consumption and to promote weight-loss over the course of six months (Lawrence et al., 2015). Our findings extend this research, as they demonstrate that implicit evaluations may also be changed by using the imagery self-regulation strategy of mental contrasting. Future research may compare the effects of mental contrasting and bias modification interventions on implicit evaluations and investigate if they may complement each other.

Future Research

Positive implicit evaluations of goal-relevant concepts. Goal-pursuit is associated with positive implicit evaluations of stimuli conducive to reaching the goal (Custers & Aarts, 2005; Ferguson, 2008; Ferguson, 2007; Ferguson & Bargh, 2004). For instance, people with the goal to

drink water or juice versus not (i.e., thirsty versus not thirsty individuals) display a more positive implicit evaluation of words conducive to drinking (e.g., water or juice) than to goal-irrelevant words (Ferguson & Bargh, 2004). In addition, the activation of a goal leads to increased positive implicit evaluations of stimuli that could facilitate goal pursuit (Ferguson, 2008). Those positive implicit evaluations, in turn, predict goal relevant behavior (Custers & Aarts, 2007; Ferguson, 2007). Based on these findings, future research should investigate whether mental contrasting also modulates implicit evaluations of other concepts related to the goal besides idiosyncratic obstacles, such as instrumental means to overcome the obstacles. Mental contrasting should establish a more positive implicit evaluation of goal-conducive concepts, such as instrumental means, in line with expectations of success.

Implicit approach and avoidance tendencies. People tend to approach stimuli associated with positive implicit evaluations and tend to avoid stimuli with negative implicit evaluations (Aarts, Custers, & Holland, 2007; Custers & Aarts, 2005; Fishbach & Shah, 2006). In line with this finding, successful goal pursuit was found to be associated with implicit approach tendencies toward goal-related stimuli and with implicit avoidance tendencies toward temptation-related stimuli (Fishbach & Shah, 2006). For instance, dieters versus non-dieters automatically approached fitness-related cues and avoided fatty-food-related cues. Dieters were faster to pulling a lever (indicating an approach movement) on trials using goal-related stimuli (versus temptation-related stimuli). Conversely, they were faster to push a lever (indicating an avoidance movement) on trials using temptation-related stimuli (versus goal-related stimuli).

Importantly, implicit evaluations are distinct from approach and avoidance tendencies. Evaluations can result in approach and avoidance tendencies. However, a positive evaluation must not necessarily implicate an approach tendency and a negative evaluation must not

necessarily implicate an avoidance tendency. Depending on contextual factors such as conflicting goals, approach tendencies to positive stimuli can be suppressed by top-down regulation (e.g., Freeman, Alvernaz, Tonnesen, Linderman, & Aron, 2015; Freeman, Razhas, & Aron, 2014).

As for the role of mental contrasting in approaching or avoiding desired futures, mental contrasting paired with high expectations of success should establish a tendency to approach stimuli related to the desired future, such as positive outcomes of attaining the desired future. However, it is unclear whether mental contrasting would lead to avoiding the respective obstacles. Rather, we assume that some obstacles can only be surmounted by approaching them, in particular when avoiding them is not expedient or possible. For example, the obstacle of freezing cold weather needs to be approached when the desired future is jogging in the snowy park. Other obstacles may also be best overcome by directly approaching them, such as overcoming one's shyness (e.g., Study 1). On the contrary, obstacles such as food temptations may be best overcome by avoiding them (e.g., Study 3). In sum, obstacles that are evaluated negatively may be linked to approach or avoidance tendencies based on the context and the chosen strategy to overcome or circumvent them, respectively. Future research should investigate more thoroughly the relation between implicit evaluations of obstacles and respective approach- versus avoidance tendencies, as well as the effect of mental contrasting on this relation.

Longevity of effects. Previous research has demonstrated that changes in implicit processes prevail until the goal is realized and end after the goal is completed (e.g., Ferguson & Bargh, 2004; Fishbach et al., 2010; Förster, Liberman, & Higgins, 2005). Similarly, research has demonstrated that mental contrasting does not only affect behaviors immediately, but up to three

months later (e.g., Oettingen, Hönig, & Gollwitzer, 2000) or until the desired future is attained.

Based on these findings, future studies should investigate whether mental contrasting affects implicit evaluations of the obstacle of reality until people attain their desired future.

Conclusion

The present research illustrates one mechanism by which mental contrasting affects energization and performance. Paired with high (vs. low) expectations of success, mental contrasting establishes a negative implicit evaluation of the obstacle of reality. Our results suggest that this implicit evaluation subsequently predicts mobilized energy that enables people to commit to their desired future and successfully attain it. Those results are relevant for various wishes, such as improving interpersonal relationships, excelling in academic tests, or improving one's eating habits. Going back to the example of improving your healthy eating, mentally contrasting this wish with the obstacle standing in the way (e.g., the chocolate cake) should change the evaluation of the chocolate cake. Seeing the chocolate cake as a negative obstacle should, in turn, should help you to refrain from it and to improve your eating habits.

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Table 1

Study 2: Means, Standard Deviations, and Correlations for Key Study Measures

Measure	<i>M (SD)</i>	1	2	3	4
1. Age	20.2 (1.2)	-			
2. Expectations of success	4.65 (1.14)	.14	-		
3. Importance of success	3.81 (1.49)	-.13	.25*	-	
4. CPS	7.06 (3.85)	.12	.47*	-.03	-
5. Reality evaluation index	-35.47 (142.81)	-.14	-.02	.05	-.04

Note. *N*'s range from 143 to 144 due to occasional missing data. CPS = Creative Personality

Scale. * $p < .05$

Table 2

Study 3: Means, Standard Deviations, and Correlations for Key Study Measures

Measure	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9	10	11
1. Age	20.39 (1.17)	-										
2. Expectations of success	4.54 (1.33)	-.02	-									
3. Importance of success	5.05 (1.61)	-.11	.36*	-								
4. Extent	4.78 (1.59)	-.19*	.02	.58*	-							
5. Self-efficacy	4.78 (1.37)	.001	.68*	.27*	-.07	-						
6. RES	2.83 (.86)	.02	.24*	.35*	.18*	.18*	-					
7. BSCS	3.00 (.63)	.14	.29*	-.10	-.38*	.30*	.08	-				
8. Healthy eating baseline	3.62 (1.00)	.03	.03	-.06	-.22*	.16*	.33*	.21*	-			
9. Reality evaluation index	-2.38 (99.36)	.08	-.01	-.04	-.14	-.004	.004	-.02	.03	-		
10. Feelings of energization	4.35 (1.24)	-.07	.47*	.44*	.16*	.42*	.26*	.30*	.13	-.12	-	
11. Commitment	3.83 (1.61)	-.04	.15	.63*	.56*	.06	.33*	-.25*	-.10	-.03	.28*	-
12. Healthy eating over 2 weeks	4.02 (.69)	.11	.11	.03	-.06	.15	.30*	.18*	.32*	.14	.15	-.05

Note. *N*'s range from 160 to 156 due to occasional missing data. Extent = How much would you like to improve your eating habits?

RES = Restraint Eating Scale. BSCS = Brief Self-Control Scale. * $p < .05$

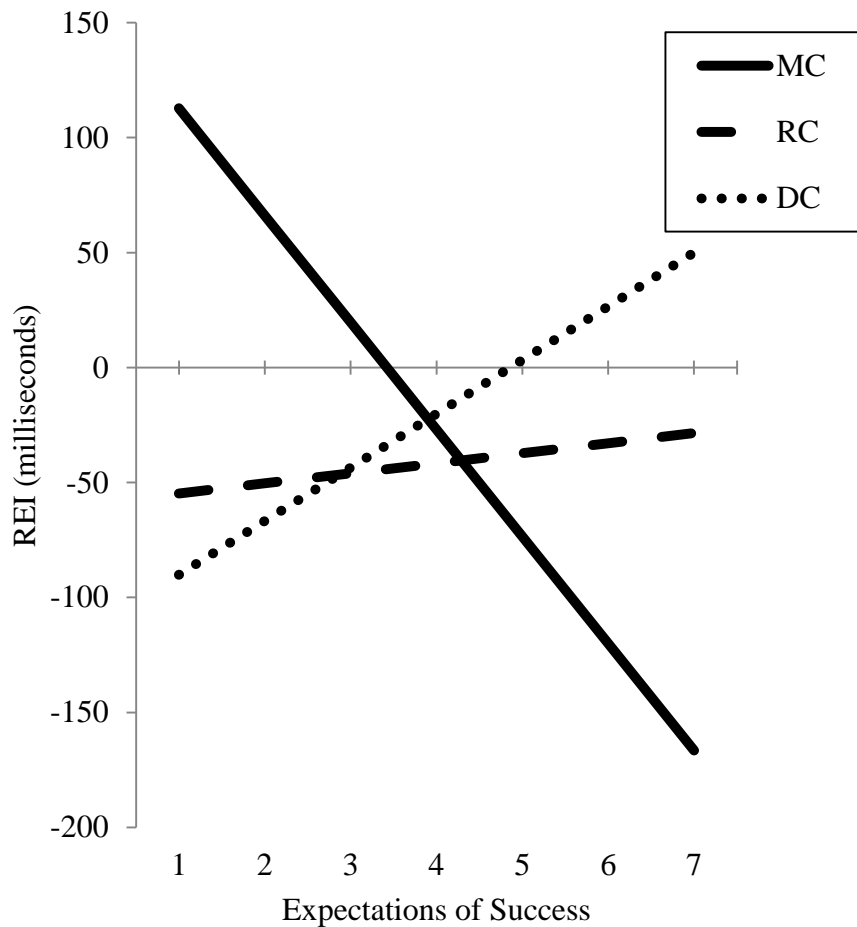


Figure 2. Study 2: Regression lines depict the relation between expectations of success and the reality evaluation index (REI) as a function of self-regulation strategy (MC = mental contrasting condition; RC = reverse contrasting condition; DC = distraction control condition). Lower REI values indicate more negative implicit evaluations of the obstacle.

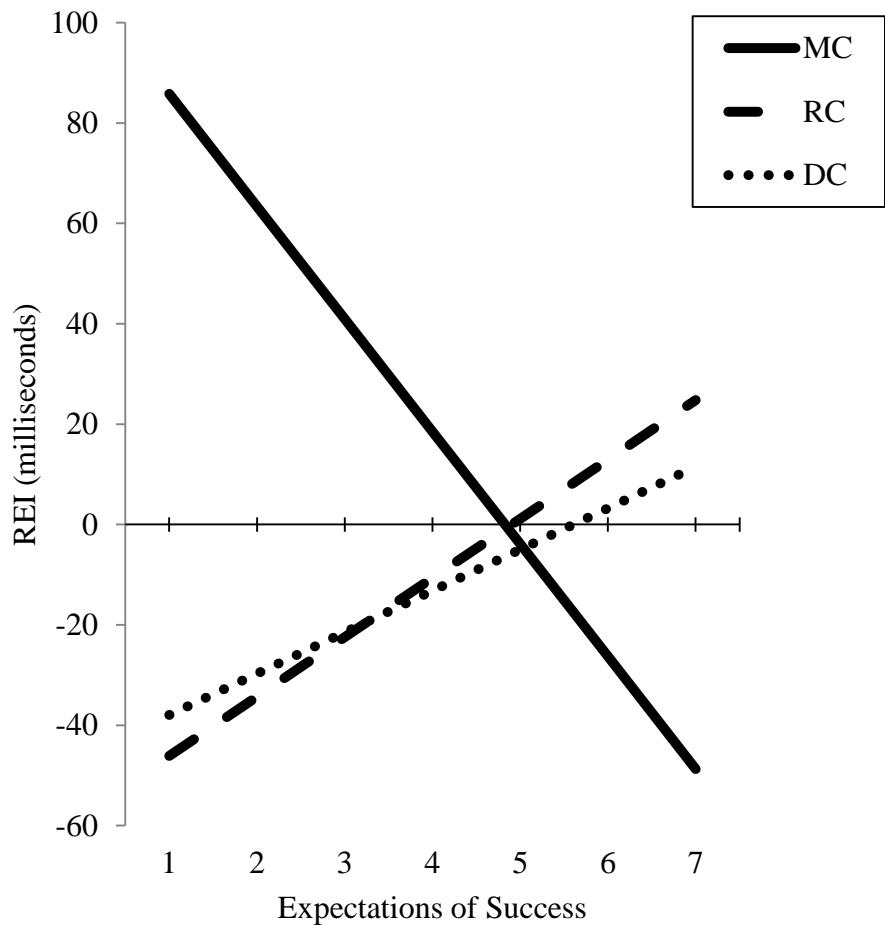


Figure 3. Study 3: Regression lines depict the relation between expectations of success and the reality evaluation index (REI) as a function of self-regulation strategy (MC = mental contrasting condition; RC = reverse contrasting condition; DC = distraction control condition). Lower REI values indicate more negative implicit evaluations of the obstacle of reality.

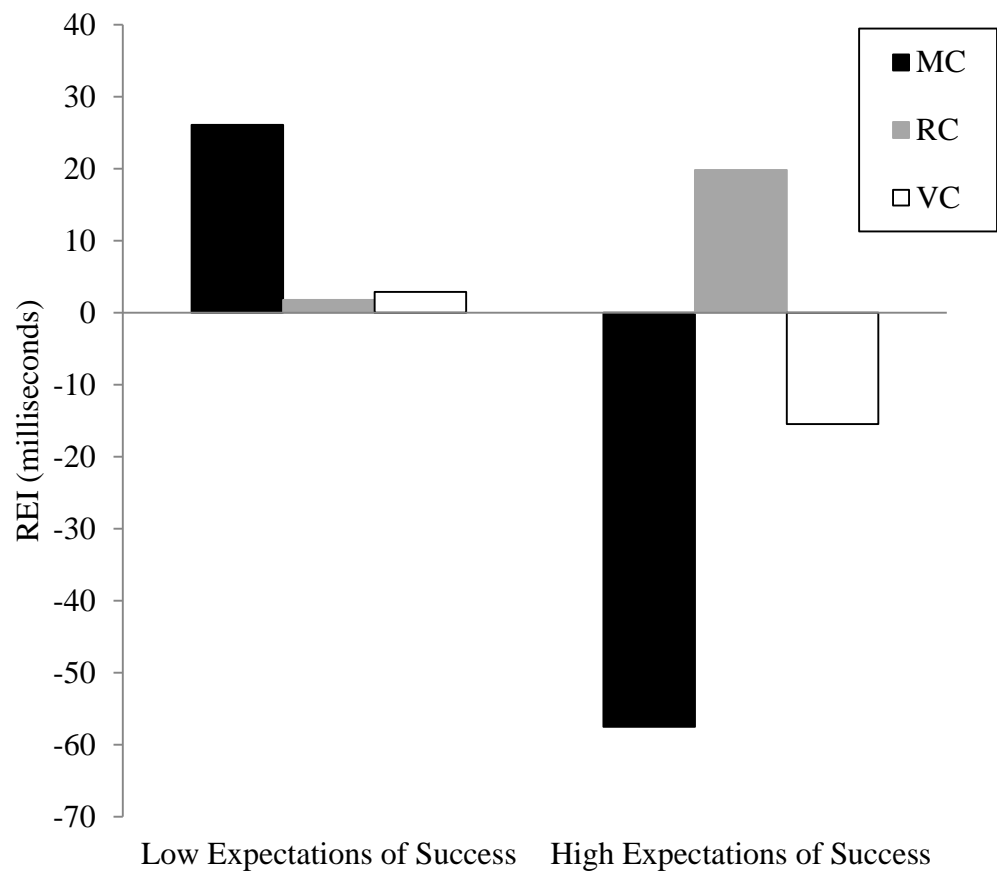
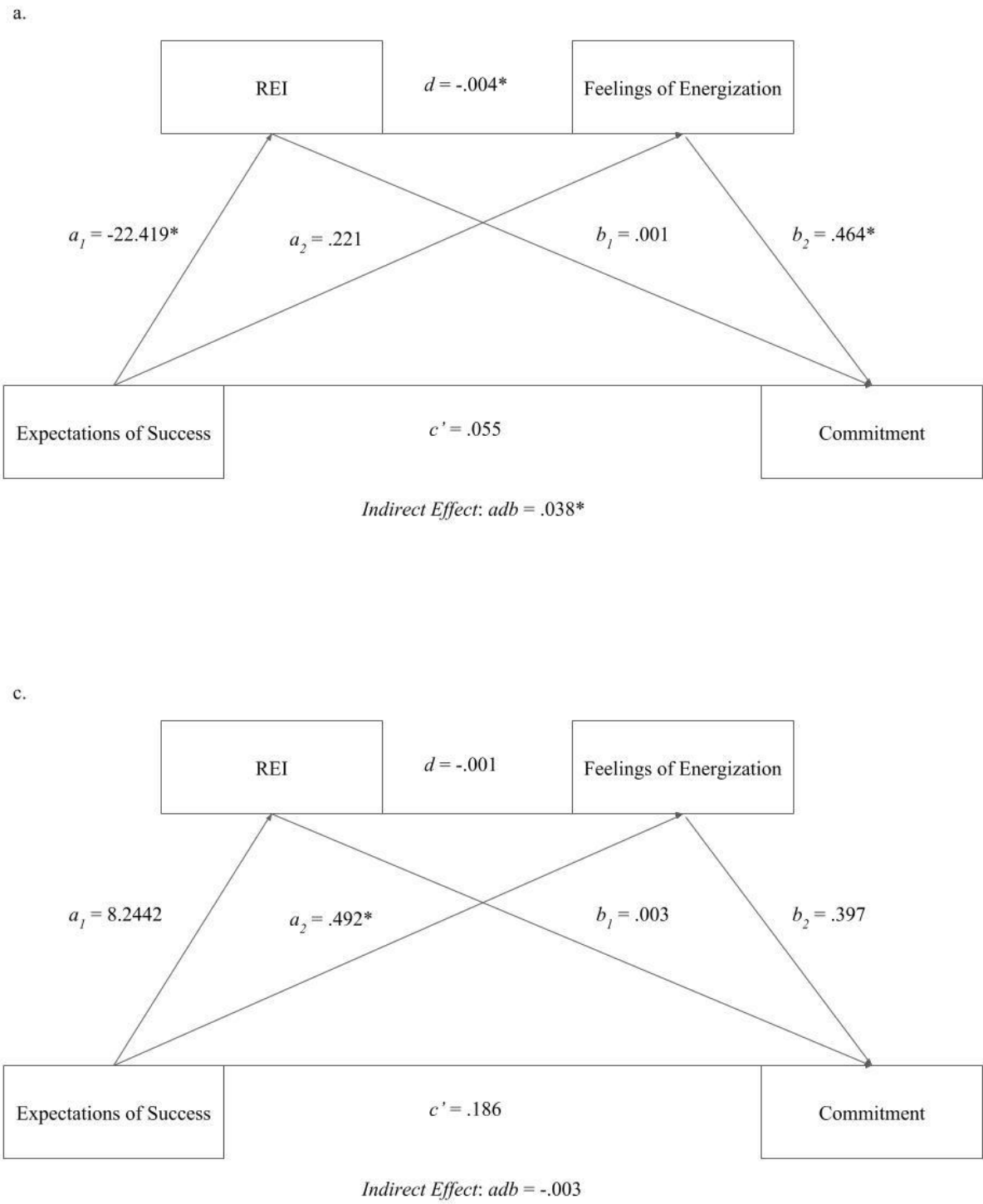


Figure 1. Study 1: Reality evaluation index (REI) as a function of expectations of success and self-regulation strategy (MC = mental contrasting condition; RC = reverse contrasting condition; VC = valence control condition). Lower values indicate faster responses to negative targets compared with positive targets following the obstacle of reality prime (i.e., greater negativity towards the idiosyncratic obstacle).



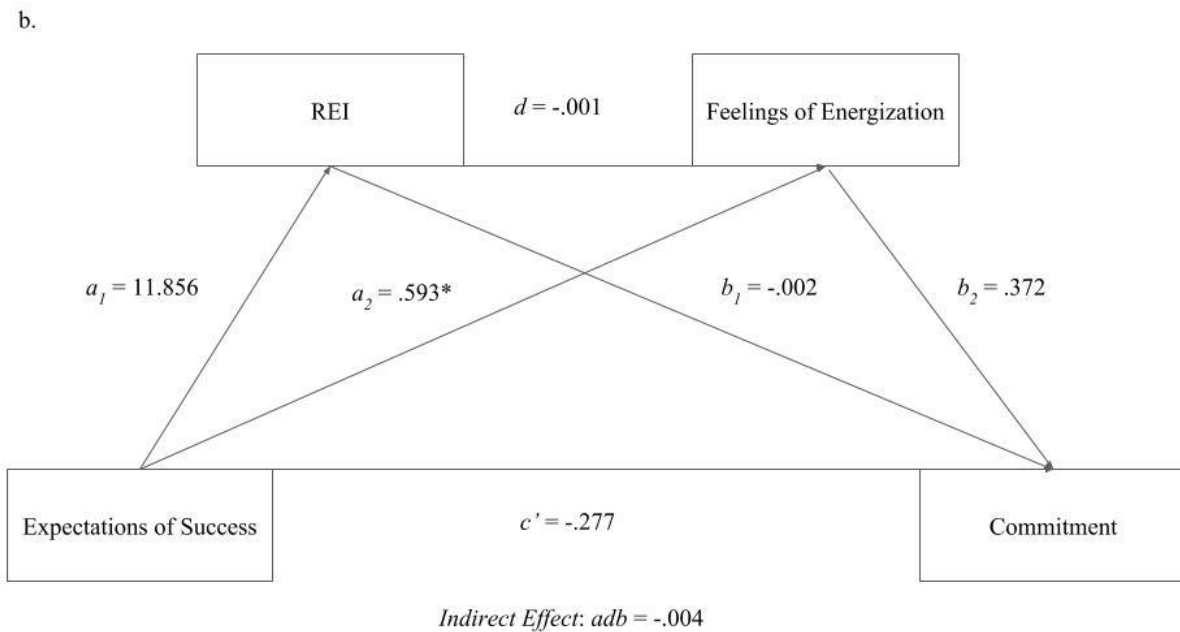
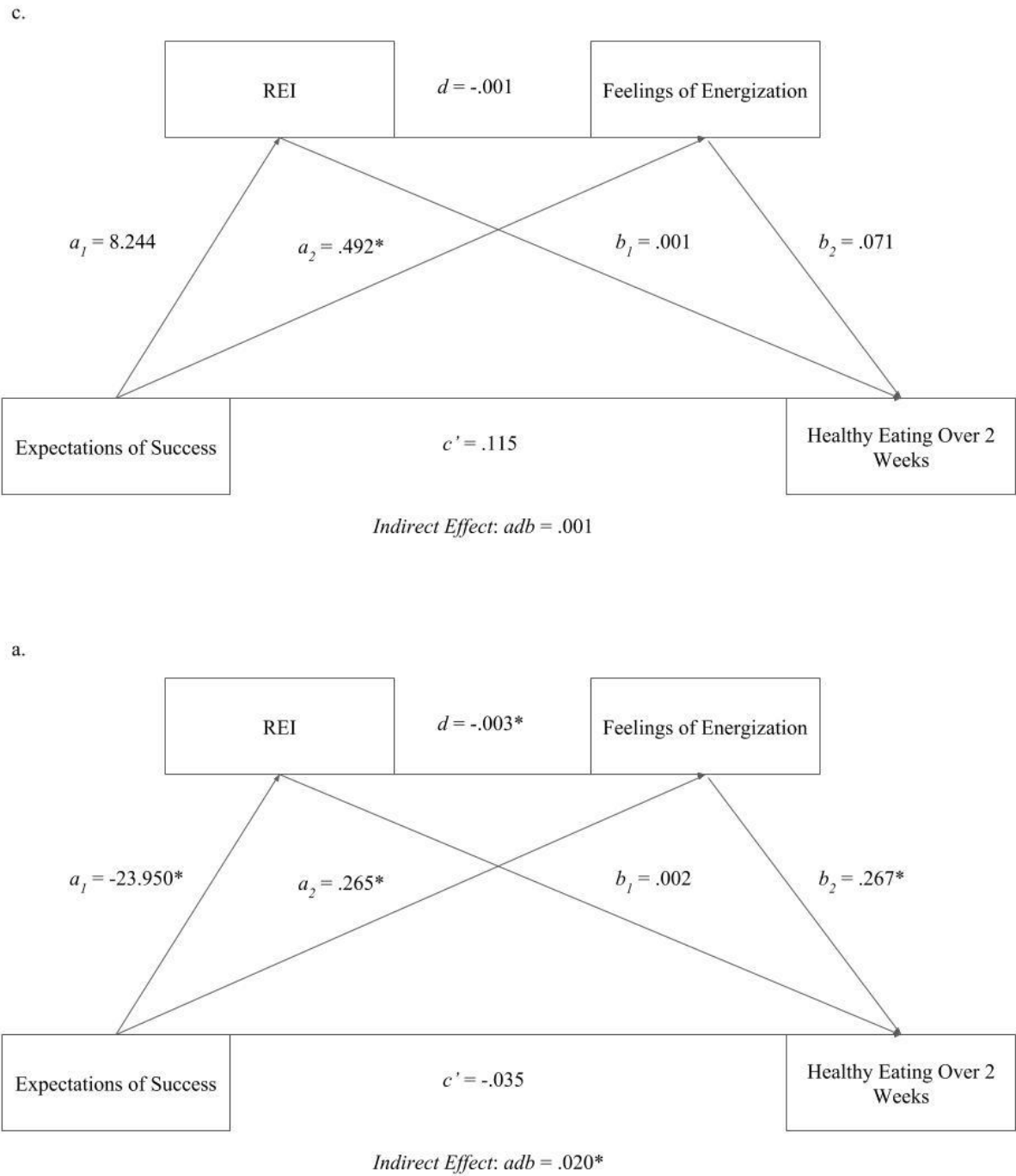


Figure 4. Study 3: Serial multiple mediator model (Model 6 in the PROCESS macro; see Hayes, 2013) for expectation of success via reality evaluation index (REI) and feelings of energization on commitment to eat more healthily: a) mental contrasting condition; b) reverse contrasting control condition; c) distraction control condition. Numbers represent unstandardized b -values.

MENTAL CONTRASTING CHANGES IMPLICIT EVALUATIONS



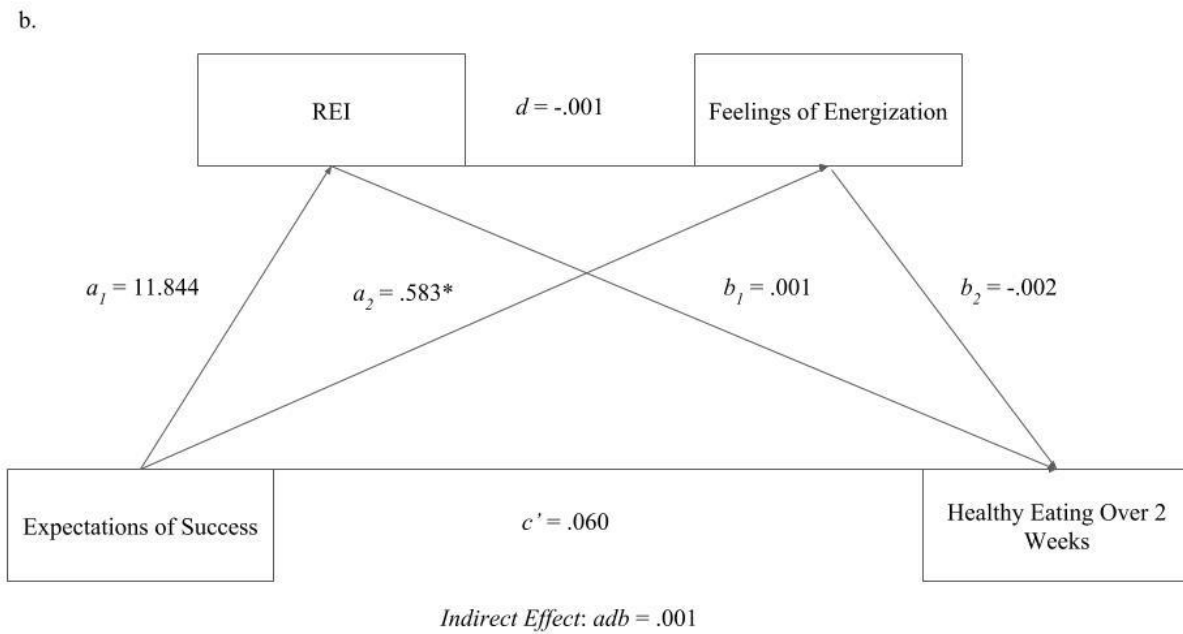


Figure 5. Study 3: Serial multiple mediator model (Model 6 in the PROCESS macro; see Hayes, 2013) for expectation of success via reality evaluation index (REI) and feelings of energization on healthy eating over two weeks: a) mental contrasting; b) reverse contrasting control condition; c) distraction control condition. Numbers represent unstandardized b-values.



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